The FOUNDRY

Volume 54
Number 4

Published
Semimonthly

CLEVELAND, OHIO, FEBRUARY 15, 1926

Castings Play Part When the Program Is Received

PHENOMENAL growth has been registered in the use of the radio during the past five years. In 1921 the activity in this direction was confined to a relatively few amateur wireless bugs who were receiving canned music from a small number of broadcasting stations scattered throughout the country, while in 1926 the use of the radio has

Interior of Blue Room, Municipal Broadcasting Station, Cleveland

become almost universal in scope, the manufacture of sets and parts ranking as one of the important industries of the country. Development has been remarkable in the value of sets in use, the number of broadcasting stations, and the range of reception, the latter fact being demonstrated during the international tests held in January. It is estimated that in 1922 there were barely 1,000,000 sets in use, in 1923 2,000,000 sets, in 1924 3,750,000 and in 1925 5,000,000 sets, while the retail value has grown from $50,000,000 in 1922, to $500,000,000 in 1925, the value of exports in the latter year being $13,000,000. It is estimated that 2,000,000 sets were manufactured in this country in 1925. Various types of castings, including many diecastings, are used in the manufacture of radio products, the application of metal in this form gradually gaining ground. Condensers now are diecast, while housings, metal parts for loud speakers, mountings and other parts of are cast.

Find Where Castings Can Be Sold

CONTENTS

Page

Ancient Chinese Excelled in Making Delicate Art Castings—By Frank A. Foster 130

Trucks Handle Materials in the Foundry—By C. C. Hermann 135

Describes Loam Molding Methods—By Ben Shaw and James Edgar 137

Easily Made Device Aids Pouring 142

Observe Centennial 144

Long Life Mold Temperatures Regulate Casting Properties—By H. A. Schwartz 147

Describe British System of Finding Foundry Costs—By T. Smith 151

Bill Wonders Why Barrels Are Scarce—By Pat Dwyer 154

Control Tests Devised for Steel Foundry Sands 157

Sharpen Tools on Stones—By Walter C. Ewalt 160

How and Why in Brass Founding — By Charles Vickers 143

Phineas, Jr. 161

The Shakeout 162

Trade Trends in Tabloid 163

Comings and Goings of Foundrymen 164

Foundry Equipment Market 166

What the Foundries Are Doing 167

New Trade Publications 168

—⊡—

PUBLISHED BY THE PENTON PUBLISHING CO., CLEVELAND, O.

BRANCH OFFICES

BOSTON ..... 1037 Old South Bldg.
CHICAGO ..... 1147 People's Gas Bldg.
CINCINNATI ..... 408 Edwards Bldg.
NEW YORK ..... 2203-2206 No. 220 Broadway
PITTSBURGH ..... 2148-49 Oliver Bldg.
SAN FRANCISCO ..... 24 California Street
WASHINGTON, D. C. ..... 401 Westory Bldg.

FOREIGN OFFICES

BIRMINGHAM, ENGLAND ..... Prince's Chambers
LONDON, ENGLAND ..... 2-3 Caxton House Westminster, S.W.I.
PARIS, FRANCE ..... 23 Rue de la Bienfaisance VIIIe

Cable address, IROTRAPEN, London

SUBSCRIPTION

United States and Mexico ..... $3.00 a year
Canada ..... $4.00 a year
Great Britain and other Foreign Countries ..... £1:0:0 a year
Single Copies ..... 25 cents

Copies published three months or more previous to date of current issue, 50 cents each

Member, Audit Bureau of Circulations, Associated Business Papers, Inc., National Publishers Association
Entered at the Post Office at Cleveland as Second Class Matter

Copyright 1926 by The Penton Publishing Co.

Ancient Chinese Art Castings

Fig. 1—Cast Iron Statue at Chin Ssu near Tai Yuan Fu Made About A. D. 900-1100

ALTHOUGH traces of ancient workmanship may be cited thirty or forty centuries old, the origin of the art of casting metal is a matter of conjecture. It must have had its beginning long after primitive man began to avail himself of the benefits of fire, but probably it was thousands of years before any recorded history.

During the stone age, when man relied on stone as the hardest and strongest material which he could master with which to do his cutting, in his peaceful occupations, stone was his most useful ally. In hunting and in the almost continual offensive and defensive warfare of his time, stone was his trusted weapon. The use of stone must have continued over extensive unrecorded periods of time. Perhaps, by some lucky accident someone discovered a lump or hard metal in the ashes of a huge bonfire and found by experiment that this new and stronger substance was harder than stone and that it would keep a sharper edge than the old stone implements he had been using.

Such a discovery opened a new era of advancement for the human race. It put the user of metal in a position of superiority to his stone-using neighbor, because he had better and more efficient weapons and tools. He was better able to conquer the fierce, food-giving and fur-bearing animals and to defend himself from them. Life, in its way, was as strenuous as it is today and existence was a constant battle with fierce animals and even more formidable men.

It is certain that the advent of the use of metals hastened the progress of the human race. It was more important as an epoch in race advancement than the use of steam or of electricity has been in our own times. The history of the world has many such great epochs and each has speeded up the life of the people to a greater degree, until at present the pace is astonishing, when one looks back on the past. Each of these great epochs seems to be speedier and shorter than the preceding.

Which Metal Came First

Probably the first metals to be reduced from a stony ore were in the nature of an alloy, probably a bronze, that is a mixture of which copper was the main ingredient. It is possible that the use of copper preceded that of tin. Copper probably preceded the use of iron although some hold that both metals were known in the dim antiquity. Copper tools were used by the early Egyptians and by the Incas of South America. It is said that in both countries they were able to temper copper tools, but the writer does not know of any well authenticated sample of such tools. Whether cast metal preceded forgings may perhaps never be settled.

Recently an expedition under the auspices of the University of Pennsylvania has made excavations at the site of the ancient city of Ur, in Mesopotamia, and has discovered metal work of great artistic merit. These discoveries throw a strong light on the state of development of civilization and the use of metals at even such an early time.

The date when these interesting pieces of metal were used is closely fixed by the inscription on the building of which they evidently were a part. Major Wooly, who was in charge of the excavations, gave as his opinion, that the metal work was made as early as 4500 years before the birth of Christ. This seems to be the oldest metal work to which a definite date can be ascribed and it antedates the recently discovered metal and other treasures in the tomb of the late lamented King Tutankamen of Egypt, by 300 years.

Excelled in Making Delicate

By Frank A. Foster

Fig. 3—Older Examples of Chinese Astronomical Instruments Were Highly Ornamented With Intricate Castings of Dragons and Allegorical Figures

Major Wooly's account thus describes these relics of early metal work:—"Tumbled down against the platform wall (on which the temple was built) were found a whole series of reliefs which decorated the temple front. Chief among these was a frieze of cattle, their bodies hammered out of copper plates and their heads cast from the same metal and inset. The animals are all lying down, seen in profile, their heads turned out to face the spectator. They are 11 inches high and 22 inches long. The treatment of the heads is remarkably realistic and as works of art these must rank among the antiquities of all lands. There are also statues of standing oxen, worked in the round which stood against the base of the wall."

Such evidences as these Mesopotamian relics, indicate a use of copper for a period far antedating these finely executed works because of the evident high degree of skill that had been developed by the Sumerians, who lived in and around Ur in that far off time of which so little is known.

Whether Chinese skill antedated that of the Sumerians or not, still is unknown. There is a possibility of the art being introduced from one country to the other, but which was the originator, or whether each developed the art independently, is an interesting line of investigation to be followed.

The earliest metal works found in China probably are contemporary with the earliest Egyptian and Mesopotamian civilization. In China, in the time of Tai Ho, (2852 to 2737 B. C.) cast metallic coins were used. Other metallic articles of great merit also are preserved from that time. The earliest preserved work of the Chinese show a high degree of skill in casting, both in bronze and iron. Even in the simpler pieces there is often a charm that has not been surpassed in any of the later work. The great and almost priceless collection of antique Chinese art in the National museum, in Peking, has many fine specimens of early cast work.

The inventive genius of ancient Chinese nowhere can be more explicitly shown than in the making of alloys. An alloy similar to German silver, under the name of *Pai t'ang*, was anciently obtained by fusing what they called *red steel* with arsenic. The manufacture by ancient Chinese, of gongs and tom-toms with their perfect tones, still remains a mystery, although their chemical composition has been determined. Many of the earliest examples of Chinese work show such a fully developed art that it is evident that it had its beginning many hundreds of years earlier.

The natives of the Indian peninsula and the Chinese both found the valuable properties of iron at an early date but much later than copper. The discovery of iron and its properties put these people on a higher economic scale than their

(*Continued on page* 133)

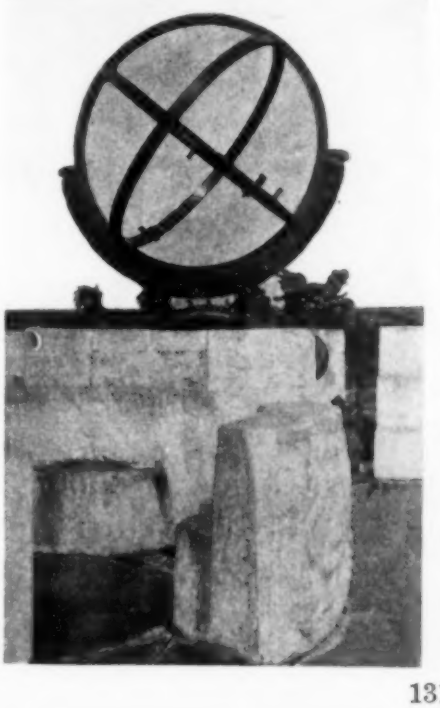


Fig. 2—Ancient Bronze Astronomical Instrument Mounted on the Wall At Peking

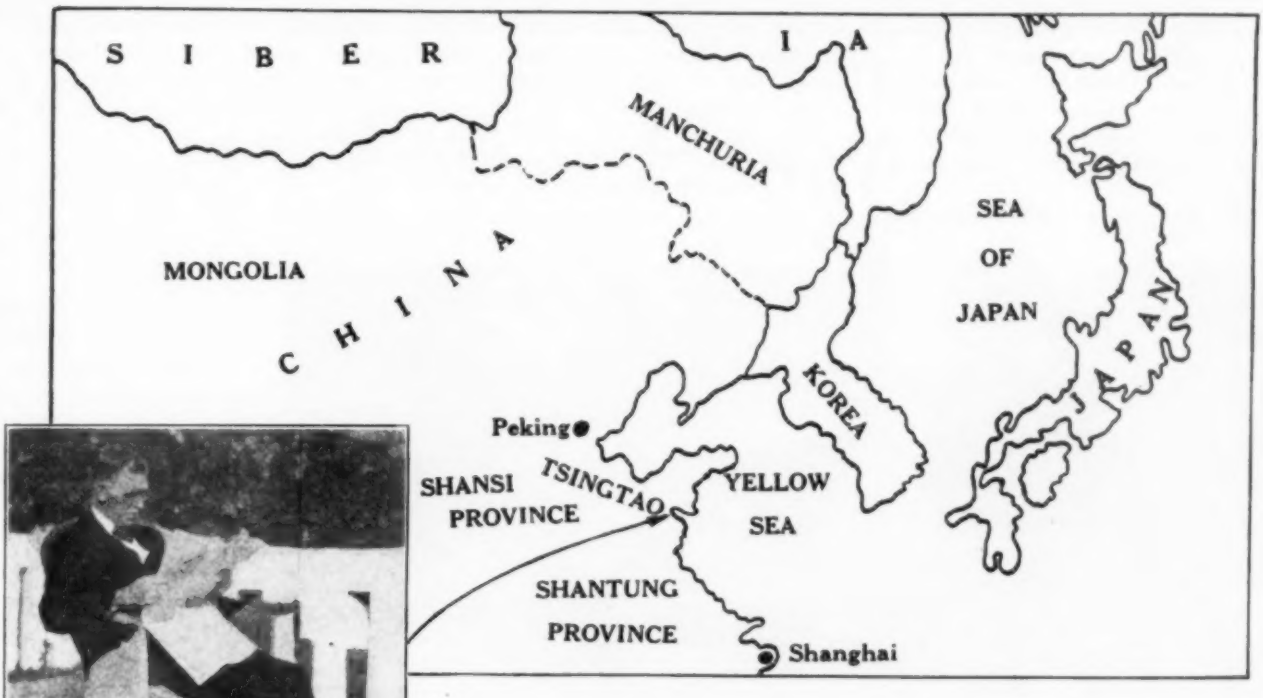
Fig. 4—Left—This Cast Iron Bell Was Made About 1079. Fig. 5—Bottom Left—Large Bronze Incense Burner at the Tomb of an Emperor. Fig. 6—Center—The Great Bell at Peking Is Covered Within and Without With Relief Characters. Fig. 7—Right—Bells Are Sounded by Striking With a Wood Battering Ram. Fig. 8—Bottom Right—Bronze Cast Instruments Are Perfect After Ages of Service Exposed to the Elements

neighbors. They have left many evidences of the early use of iron to be admired by present day peoples.

In various parts of China are to be seen specimens of large cast work, of great antiquity, both in iron and bronze. Among these are statues, huge incense burners and great bells. All of these show wonderful skill and artistic ability.

One of these huge bells shown in Fig. 5 is located in the suburbs of Peking. It measures about 14 feet high by 10 feet in diameter and is completely covered, inside and outside, with Chinese words in high relief, each occupying a space about 1½-inch square. The words are said to be the translation, from Sanscrit into Chinese, of two celebrated Buddhistic books. The surface still shows the fin marks of the joints of the numerous cheek pieces of the dry-sand cores which formed the outer surface.

Foundries Always Held His Interest



The author of this article has spent many years in China. At present he is in Tsingtao, Shantung province, a city of about 100,000 population, established by the Germans previous to 1900. The German control was taken away at the start of the World war and Japan maintained sway until the treaty of peace when the Chinese obtained possession. A railroad leads back to the interior and several lines of boats operate from the port for Europe and America.

AS A SMALL boy, in the late 1860's, I spent a good deal of my time in and around the shops and foundry of the late Baxter D. Whitney, Winchendon, Mass., watching the magic of making things of metal and wood, chatting with the workmen and learning how they did their work. There was a never-ending round of sights and sounds to interest me. This was followed a few years later by an apprenticeship at the machinist's trade at the shops of the Chase Turbine Mfg. Co., Orange, Mass.

One of my earliest recollections of the machine shop in Winchendon is of climbing upon my father's bench and scratching a series of circles on the lid of his tool chest with his compasses. This record of my first efforts at mechanical drawing was thus preserved to the present day.

When I tired of watching Dave Desletts shape out pieces of red hot iron under his noisy trip hammer, I would go in next door and watch Luke Hale and his sturdy sons boldly pick up a horse's foot and cut its toenails or string up a huge ox in the great wooden frame while they fitted it with new shoes.

Tiring of this I would go a little farther to the foundry presided over by Mr. Beaudry or Mr. Peasley, and watch the men make molds to be filled with the melted iron which ran like molasses from the big stack. Here I was wont to linger the longest and watch the fireworks when they pulled the prop from under the stack. These were wonderfully attractive to me.

When I came out to China, in connection with the mechanical department of a government technical school, I became much interested in observing the foundry conditions in this far off country. I have found much that is of interest to me and perhaps it may be of interest to some of the foundry people in the home land. Much of the practice here is the same as it was a thousand years ago—perhaps two thousand. The founder's art has been an important factor in the economic life of this country.

I have made this slight record out of love and respect for a useful art and its followers.

Frank A. Foster

The accumulation of the raw materials for this bell alone must have been an undertaking of no small size in those days. It is estimated to weigh about 130,000 pounds. The metals evidently came from far distant points. Transportation then was of the most primitive character.

How Did They Handle Materials?

It is quite possible that the metals for so large a bell were brought to the vicinity of the place where the bell now stands, on camels or on human backs. Even today camel transportation service competes with the railway in some lines, in and around Peking, while transportation on human backs is one of the commonest means employed in large regions of China.

This bell must have been cast near the present location because it is inconceivable that it could have been moved far after it was cast. It is possible that wood was used as fuel for melting the metal, although coal may have been used in some parts of China at an early date. Methods of melting metal at that time probably were no better than at the present day. In fact, it seems from what we can learn from the methods of doing other work, that the present day methods are practically the same as at that early period. Many ancient pictures show industries being carried on with practically the same equipment that can be seen today in numerous places only a little back from the comparatively few centers where foreign influence has made itself felt. That being so, we can assume that the casting of these great bells was done with apparatus and by methods to be seen in the same locality at the present day. Some of these methods will be described in articles which appear later.

The great bell at Peking is mounted in a small building where it is difficult to get a good photograph of the whole of it. However, the illustration reproduced as Fig. 5 will give some idea of its size and contour. Chinese bells differ in shape from those usually seen in America, being taller in proportion to the diameter. They are not swung to ring them but are struck on the outside by the end of a heavy wooden beam suspended horizontally by ropes so as to hit the lower rim of the bell, as shown in Fig. 7. The tone is indescribably sweet and musical, especially when heard at some distance.

The bell in Fig. 5 is one of five, all of practically the same size, said to have been ordered by one emperor, the other four being without the lettering. One of these is hung in a massive high tower in the north part of Peking and is the one shown in Fig. 7. To have put this heavy bell in place must have been a great engineering feat for the people of that early date.

Fig. 4 shows another large bell made of cast iron. This bell was made in 1079 A. D. and is in the city of Ping Ting Chow, Shansi province. It carries the inscription, "Long live the emperor, Long Live the emperor. Seasonable winds and rain. Peace to the country and people." The city in which this bell is located is in the heart of a great iron mining district and the bell seems to be a good testimonial of the ability of the people of that time to handle large iron castings skillfully.

Other samples of ancient cast metal work are to be seen on and near the east wall of Peking. These consists of several large bronze instruments for astronomical observations three of which are shown in Figs. 2, 3 and 8. The designs are distinctly Chinese in character and wonderfully well executed. They are probably the oldest distinctly astronomical instruments still extant in the world, unless some of the stone, so-called astronomical instruments in Egypt and Central America can be rightly so called. They were erected 300 years before the earliest European observatory, which was built by Frederick III of Denmark in 1576, where Tycho Brahe made his remarkable observations and discoveries. These astronomical instruments of the Peking observatory were made by the order of Kublai Khan, the first emperor of the Mongol dynasty, in the year 1279. They were made by the celebrated astronomer and hydraulic engineer, Kuo Shou-ching, who was born in 1231. His biography is fully recorded in the annals of his time.

Fig. 9—Old Type Cupolas Still Are Employed Even in Modern Schools Such as that Pao Ting Fu, in Chihli Province

Modeled After Earlier Set

These Mongol instruments were modeled after those of an even earlier set made for the government and set up at K'ai Feng Fu, Honan province about 1050 A. D. In 1670, after the Jesuit missionaries were promoted to positions on the astronomical board, at Peking, Pere Verbiest reported the Peking instruments to be worn out, cumbersome, hard to turn and overlaid with ornament. He then was commissioned to make six new instruments, two of which are shown in Figs. 2 and 8. These are of the same general character as the old Mongol instruments, but are more accurate in their construction and easily adjusted. They were evidently made after the model of Tycho Brahe's instruments and the circles are all divided into 360 degrees in-

(*Concluded on Page* 146)

Fig. 1—Truck With Railroad Rails as Guards Haul Pig Iron. Fig. 2—A Special Type of Dump Truck

Trucks Handle Materials in the Foundry

By C. C. Hermann

MUCH may be accomplished in saving labor by revising transportation systems and replanning production operations. Moving points where raw materials is stored, closer to the preliminary manufacturing operations results in a reduction in overhead; elimination of turns and corners in material movement results in additional speed; and the provision of adequate road bed results in decreased power for movement.

The problem of handling materials from the car to the storage varies, depending on railroad facilities and the ground area covered by the industry. The industrial railway is used widely where a large area is covered and the hauls are long, most of the distance being in the yards. This system has its objections, many of which may be overcome by the installation of heavier track, heavier frogs and switches supported on a sound road bed. The author has observed that many of these systems are built for lighter loads than are actually placed upon them resulting in loss of considerable time in placing cars back on the track and maintenance of trackage and equipment. Unless numerous switches are incorporated much time will be lost by men waiting for the right-of-way.

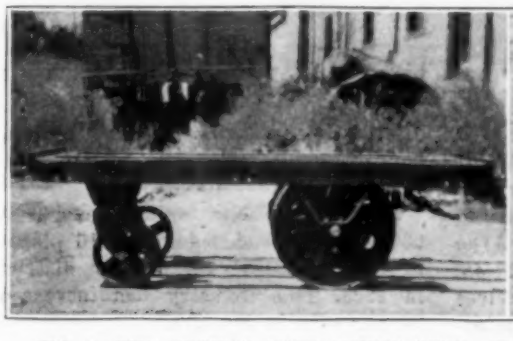
The industrial railway truck may operate efficiently only where track has been laid, limiting the system unnecessarily.

Considerable trucking is accomplished in many industries, even in the manufacturing departments, by using the shipping platform truck. These trucks are available only for manual operation. They do not adapt themselves well to tractor hitching and tandem operation. This is due to the truck balancing on the two centrally located wheels. The entire load rarely is balanced, so that one of the end caster wheels invariably is brought into play resulting in increased draft of the truck. The truck also is harder to control.

Trucks adequately adapted to industrial tractor manipulation are in use at the plant of the Union Malleable Iron Co., Moline, Ill. These trucks were designed by the writer some eight years ago and have been in constant service since. C. Howard Ross, the present manager has stated that they have proved servicable and efficient and maintenance has been a simple matter, of little expense, consisting principally of renewal of the bearings occasionally.

Figs. 3 and 4 illustrated the base truck adopted as a standard base or gear. This base weighs 500 pounds and has a capacity of 3 tons. The general dimensions are as follows: Length overall 72 inches; width overall 28 inches; heights 19¾ inches; wheel base 31¼ inches. The frame is made up of 2½ x 3¼ x ¼-inch angle iron bent to round corners. A hitch bar at both ends of the frame enables these trucks to be hitched tandem to each other so that a string of any number may be hauled behind the tractor. Bumper angles are provided on the ends of the truck transmitting shock due to collision directly to the truck frame. No part of the gears project beyond the frame.

The front wheels are of caster type, 10 inches in diameter with a 3¼-inch face. The bearing is provided with rollers and is lubricated by hard oil fed by compression grease cups. The rear wheels are cast iron 18 inches in diameter with 4¼-inch face and equipped with roller bearings and grease cups. The rear axle is of 1 7/8-inch cold rolled steel and is attached to the frame by four ½ x



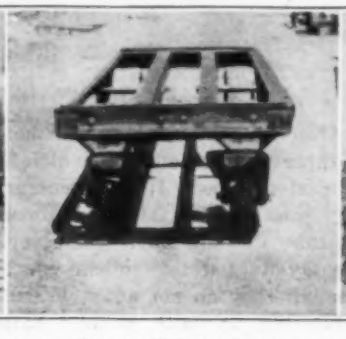


FIG. 3—THE SPECIAL BASE TRUCK USED. FIG. 4—END VIEW OF BASE TRUCK. FIG. 5—ONE TYPE OF HOPPER TRUCK

1½-inch steel forgings. The wheel gage is 17¾ inches both front and rear.

The flat top truck or standard base is used for various purposes. All castings are hauled to the mill room in pans piled on the flat base. Loads of 2500 pounds and over have been handled at one time by one truck. Stakes may be placed on the base and high loads of long material may be handled. A rigid draw bar is provided for attaching the truck to the tractor and chain hitches are used to couple trucks together for tandem pulls.

The standard base equipped with two pieces of 60-pound bent railroad irons for the purpose of hauling pig iron is shown in Fig. 3. This truck will carry 5500 pounds of pig to the

FIG. 7—ANOTHER TYPE OF TRUCK DESIGNED FOR GREAT STRENGTH

FIG. 6—A TYPE OF TRUCK HAVING THREE WHEELS

load and several trucks usually are hitched tandem and drawn by the tractor. The illustration shows a string of these loads emerging from the pig iron storage yard and on the way to the malleable furnaces. A complete charge of pig iron is hauled to the furnace at one time eliminating a number of trips daily, there being eight furnaces in operation continuously.

Fig. 5 shows the hopper type of truck. This truck and hopper weighs 1250 pounds, the hopper having a capacity of 18.3 cubic feet. The net loads of different materials it will handle are as follows: Coal 950 pounds; ashes 790 pounds; core sand 1900 pounds; sprues 2290 pounds, and castings 1580 pounds. The hopper is held in an upright position by a locking pin inserted in matched holes of two sectors revolving upon each other, one of which is secured to the base of the truck and the other to the hopper. When the hopper is to be dumped, the pin is pulled and the hopper rolled to one side. Dumping may be effected from either side.

Fig. 2 shows another style of hopper mounted on the same base as shown in Fig. 3 and 4. This hopper is mounted so that it may be dumped easily, the unbalanced weight returning the hopper to its receptive position where it automatically is locked against another dump until manually operated. The capacity of this hopper is slightly under the hopper shown in Fig. 5 but the construction is heavier. Such materials as sand, coal, ashes, sprue, castings and refuse are handled in these hoppers.

Another type of truck found advantageous when used with the tractor is shown in Fig. 6. This truck is much lower and is constructed lighter than the line previously described. The truck is essentially a flat top truck or platform mounted on three wheels one of which is of the caster type. It is necessary to load this truck fairly uniform to maintain its stability. However, the type is adapted to tandem operation, although they do not adapt themselves to backing up with a load satisfactorily due to the light construction and the likelihood of spilling. Fairly level driveways are necessary for their successful manipulation.

Fig. 7 shows another type of industrial truck mentioned principally because of its strength coupled with its lightness. The frame is constructed of wood and the front trucks are of the fifth-wheel type. This truck is rigid and possesses a great range of usefulness. Fig. 8 shows the manipulation of a string of these trucks up an incline.

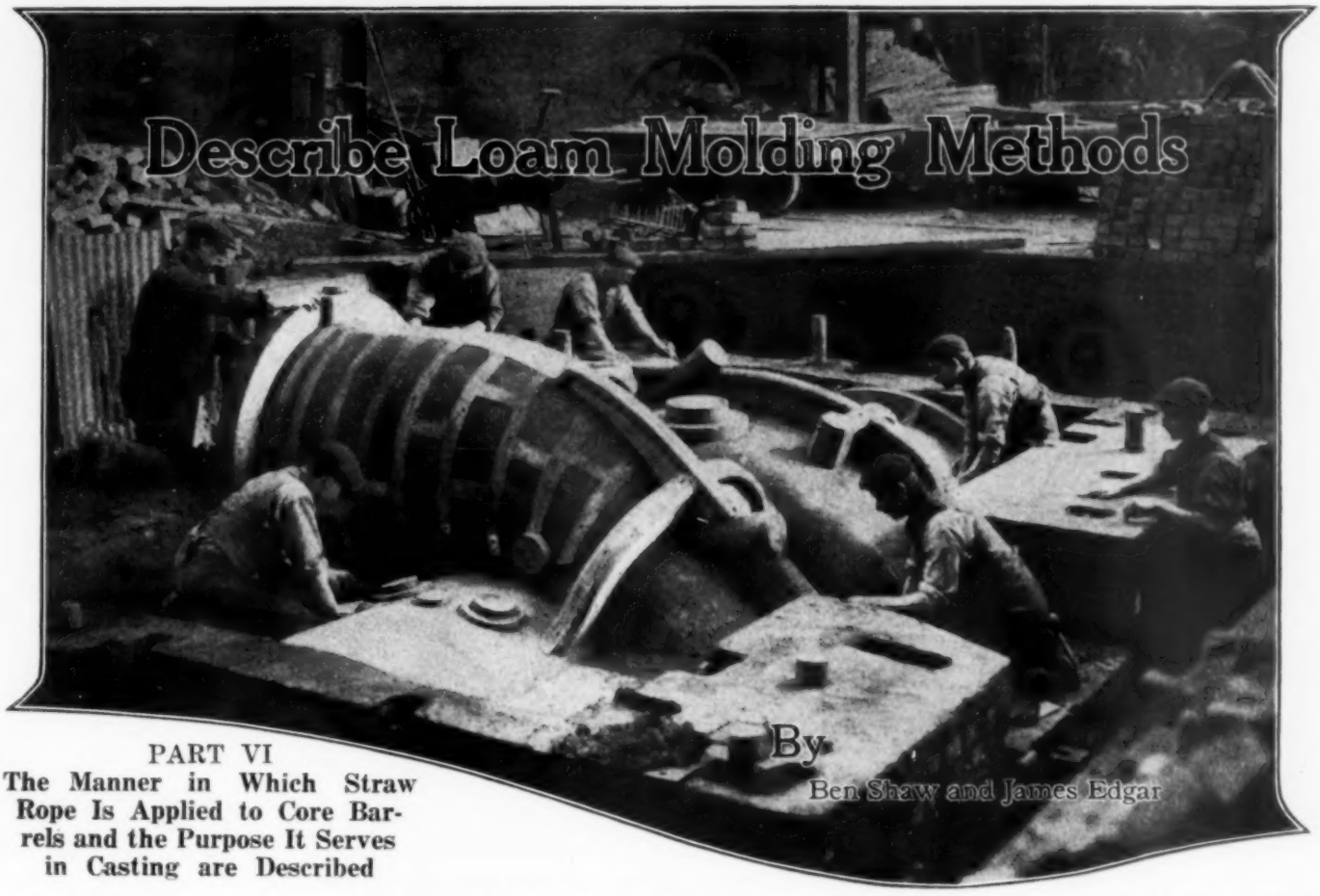
FIG. 8—MANIPULATION OF A STRING OF TRUCKS UP AN INCLINE

Electrical Improvements Achieved in 1925

Electricity, the modern handmaiden, serves all branches of civilization, but industry profits most from its service. Developments in the use of electricity command world-wide attention because of this widespread use. To portray some of the developments fostered by its engineers, the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued a booklet featuring new and improved electrical equipment.

The booklet is well illustrated and covers apparatus from generating and distributing machines to the electric flat iron.

By-product coke valued at $100,000,000 was produced in the 16 plants in the greater Pittsburgh district in 1923. This industry has increased 71 per cent in 5 years.



Describe Loam Molding Methods

PART VI

The Manner in Which Straw Rope Is Applied to Core Barrels and the Purpose It Serves in Casting are Described

By Ben Shaw and James Edgar

SO FAR as the writers are aware a truly comprehensive article on any one division of loam work never has been written because the range of jobs in any one division is small. The skilled loam molder modifies the set of basic principles to suit each particular job. However, in horizontal loam coremaking there is not much scope for deviation from established practice. One of the first jobs the apprentice coremaker gets is to run up small loam cores on a horizontal spindle. In this way he gradually obtains a knowledge of the proper manipulation of loam to get good castings which are not surface marked with dumb scabs. Even in foundries where dry sand is preferred to loam for the general run of work, loam is used for many of the plain cylindrical cores.

Character of the tackle and materials required for the work depends on the average size of the jobs, finish required and some other minor factors. Straw rope in cylindrical work on the horizontal spindle serves the same purpose as bricks in vertical construction. The rope roughly forms the shape, it facilitates venting and also contraction of the casting. If this elasticity were not required, obviously the quickest method would be to apply a thin coating of loam to a metal barrel or arbor just a little less in diameter than the required core.

Straw rope is prepared in sizes ranging from 1/2-inch diameter upward and in average lengths of 100 feet. Some of the larger foundries have found it profitable to install machines for making their own rope, but the majority of foundries prefer to buy their rope from regular foundry supply houses. Hay is used extensively in some places instead of straw, but the straw users claim superior venting properties for their choice.

Horizontal Cores

Wood wool also is twisted into rope and successfully used. Some foundrymen claim that wood wool is superior even to straw and impartial experiments seem to indicate that one is as satisfactory as the other. Old pit props frequently are used for making wood wool rope. The blocks to be reduced are gripped between two toothed rollers which automatically feed them on to the serrated knives of a planing machine. The wool obtained in this manner is twisted on the same type of machine as that employed for straw twisting. Wood wool is mentioned here because it seldom is used, probably because so few foundrymen are aware of this admirable substitute for straw.

In sweeping horizontal cores on the spindle the aim of the experienced coremaker is to obtain a core in which the loam shell will be sufficiently strong to resist the pressure of metal in the mold and yet will yield slightly as contraction takes place and thus prevent the casting from cracking. Short cores usually can be made more conveniently on the vertical spindle, while long cores can be made more quickly on the horizontal spindle. The tackle depends on whether the core is to be swept on the bench or on a pair of trestles. Some foundrymen are extremely ingenious in rigging up extemporaneous equipment for occasional loam jobs.

It always is more profitable to use suitable equipment. Figs. 40 and 41 illustrate two suitable forms for a small bench rack with notches on the top edge to serve as bearings for the spindles or trunions. In service the notches are well greased and the end of the spindle is squared to take a crank handle. A small spindle usually is bent at one end to a crank shape as shown in Fig. 51.

Small cores swept on bench racks are removed to the stove and baked, but large cores are swept up on racks fixed to a bogie and left on the racks until they are dried. A common type of floor rack of rigid design is shown in Fig. 42. The core board which rests on the rack usually is kept from moving by heavy weights. With large

cores it is bolted. In one design of rack the board is bolted to a projecting arm.

Arbors are made in greater variety than racks. Were it not for the necessity of forming a compressible core it would be more economical to cover a metal arbor with a thin layer of loam. Some foundrymen have experimented with various forms of collapsible core barrels, but most of them are more ingenious than practically useful. The simplest form probably is that in which a wrought iron or steel pipe is split along one side for the entire length. When the barrel is at normal size this slot is from 1/8 to 1/2-inch wide. This space is sufficient to take up the contraction as the surrounding casting cools.

Barrels Are Vented

Core barrels are perforated freely with vent holes, either cored, punched or drilled, depending on whether the barrel is a cast or rolled product. Fluted barrels without vent holes sometimes are used. They will prevent the metal from going through to the interior of the barrel in the event of it penetrating the loam and straw. Gases that are generated as the core is surrounded by molten metal escape along the flutes instead of through vent holes leading to the interior of the barrel. However, the danger of metal breaking through the ordinary perforated barrel is comparatively negligible. Long barrels are fitted with trunions at both ends. Construction of a barrel clearly is shown in Fig. 47. A core from which the spindle is to be removed is shown in Fig. 51. In cores of this character bent irons are introduced to reinforce the sand and the center is built up with successive layers of rope.

After the board is weighted or bolted at the correct distance from the barrel or spindle a helper turns the crank while the coremaker guides the straw rope in a tight fitting spiral from end to end. The rope is held tightly and each course or layer is rubbed with loam before a second course is applied. The number of layers required will depend on the shape and size of the proposed core compared with the size of the barrel. The final layer brings the rope within 3/4-inch of the radius of the finished core. This 3/4-inch space afterward is made up with rough loam rubbed on while the barrel is revolving. Usually the size is made up slack and the rough core is placed in the oven for a preliminary drying. Afterward it is taken out. Cracks and other imperfections are repaired and the entire face finished smooth with a thin coat of slurry. The core then is blackwashed and placed in the oven again for a final drying.

Other Horizontal Cores

Where the spindle is to be removed from the core before the core is placed in the mold, the first layer of straw rope is wound upon a clean spindle. In this manner the rope does not adhere. Sometimes cores are made on horizontal spindles for castings that are to be poured in a vertical position. Where the core barrel may be pulled out of the casting immediately after the metal has set, a coating of loam without any foundation of straw rope, is sufficient. Small cores sometimes are swept directly on the spindle and the spindle is removed before the core is placed in the mold. Cylindrical cores of irregular shape are swept as readily as cores of uniform diameter. Core irons of suitable shape are incorporated in the core as shown in Fig. 51. Cast iron plates or circular arbors sometimes are wedged to a central barrel for the same purpose.

Under certain conditions loam may be used to advantage instead of expensive wood patterns. A typical case is illustrated in Figs. 45 and 46, showing sections and outside view of a large stern tube casting, stiffened with ribs and with a couple of facings cast on as indicated. Rarely is more than one casting required, therefore a wood pattern and corebox represent extravagant practice. Even if a dozen castings were required they would not justify the use of a wood pattern. The only actually necessary wood pattern parts required include suitable sweeping boards and a few small subsidiary parts which cannot be formed satisfactorily with the boards that are used.

The pattern board shown in Fig. 43 is cut to follow the contour of the outside of the casting with the exception of the flange, ribs and facings. It is extended beyond the ends of the drawing for convenience in handling and also to form core prints.

Gage Sticks Needed

Profile of the core is cut on the core board Fig. 44. An extension at each end represents that part of the core designed to rest in the prints. On account of the extreme length of these boards it is advisable to attach a good stiff batten on the lower side for almost the entire length. The sectional thickness of the casting usually is indicated on this board as shown in the dotted line in Fig. 44.

Two forms of gages are shown for setting these boards correctly in relation to the center line or the spindle. The gages *a*, *b* and *c* Fig. 43 are short sticks attached to the upper side of the board when not in use. According to shrink rule measurement they are cut to the exact diameter of the casting, less half the thickness of the spindle, at the points immediately below them and marked by the arrows. In the second method illustrated in Fig. 44 the dimensions are stamped or painted in suitable recesses in the board. In this instance arrows also are painted on the edge of the board to show the points at which the measurements are to be taken. Subsidiary pattern parts, the flange, rib and facing are shown in Fig. 49.

Adjustable racks mounted on wheels as shown in Fig. 56 are the most convenient for this class of cores. They may be moved into and out of the drying oven with a minimum of handling. The general arrangement of the tackle and the method of sweeping the core is shown in Figs. 54 and 56. Where only one long spindle is available the core is swept first and dried. The pattern thickness then is

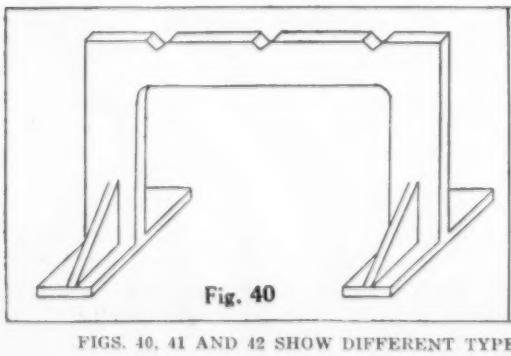


Fig. 40

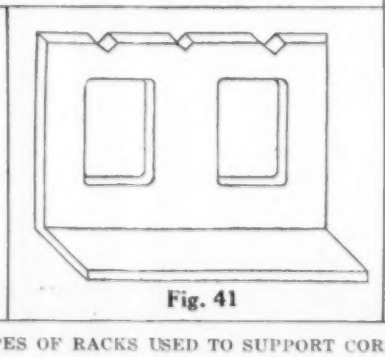


Fig. 41

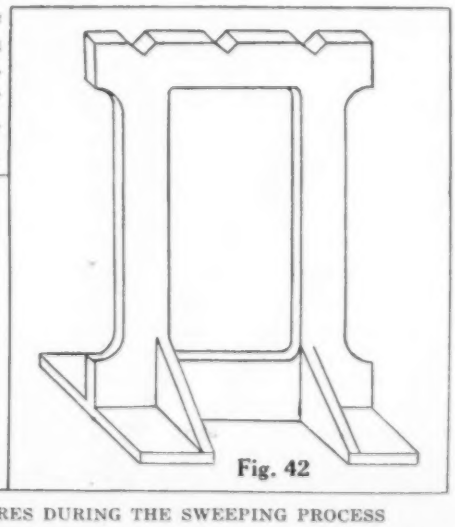


Fig. 42

FIGS. 40, 41 AND 42 SHOW DIFFERENT TYPES OF RACKS USED TO SUPPORT CORES DURING THE SWEEPING PROCESS

ACETYLENE AND OXYGEN CYLINDERS

SAFE PRACTICE IN STORAGE, CARE AND HANDLING

(*Continued from Data Sheet No.* 608)

E. *To Connect Acetylene Regulator.*

Before connecting the acetylene regulator to the cylinder, be sure that the cylinder valve is operating properly and that there is no leak around the stem. Do not attempt to locate a leak in an acetylene connection with an open flame; use soapy water. (Use pure castile or ivory soap). If a leak is found, observe precautions outlined in paragraph 7 under heading "Acetylene Cylinders."

Connect the acetylene regulator (left hand connection) in the same manner and observing the same precautions as outlined for the oxygen regulator in paragraphs 3 to 8 of section D.

Open the acetylene cylinder valve by means of the wrench supplied for that purpose. This valve should not be opened more than one and one-half turns. The pressure in the acetylene cylinder will then be shown on the large gage.

Do not blow out hose with acetylene, as the accumulation of free combustible gas in a room is a hazard.

F. *Connecting the Blowpipe.*

Connect the oxygen hose from the oxygen regulator to the hose connection on the blowpipe marked OXYGEN. Open the blowpipe valve.

Connect the acetylene hose from the acetylene regulator to the hose connection on the blowpipe marked ACETYLENE.

Select the proper welding head or cutting nozzle (according to the chart or table furnished by the apparatus manufacturer) and screw it carefully and tightly into the blowpipe.

Adjust the oxygen regulator by turning the pressure adjusting handle to the right until the low pressure gage indicates the proper pressure as given in the welding and cutting chart, while the blowpipe oxygen valve is open and oxygen passing through the nozzle. Then close the blowpipe oxygen valve.

Open the blowpipe acetylene valve, turn the pressure adjusting handle on the acetylene regulator to the right until acetylene is passing through the blowpipe, then close the blowpipe acetylene valve.

G. *To Light the Blowpipe.*

Open the acetylene valve fully. Open the oxygen valve slightly. Then light, using a blowpipe lighter. After lighting, open the oxygen valve wide and adjust the acetylene valve to secure neutral flame.

(*Continued on Data Sheet No.* 610)

ACETYLENE AND OXYGEN CYLINDERS

SAFE PRACTICE IN STORAGE, CARE AND HANDLING

(*Continued from Data Sheet No.* 609)

H. *To Shut Off the Blowpipe.*

When the welding or cutting is finished, stop the flame by closing acetylene valve and oxygen valve at the blowpipe handle in order named.

When the welding is to be stopped for a short time, release the pressure adjusting handles of the regulators by turning them to the left.

When the operations are stopped for a longer period (over night, during lunch hour, etc.), close the cylinder valves in addition, and release all gas pressure from the regulators by opening the blowpipe valves momentarily.

I. *Maintenance.*

Do not use blowpipes or regulators which are in need of repair.

If a regulator creeps—this will be indicated on the low (working) pressure gage by pressure building up when the blowpipe valves are closed—have the regulators repaired at once.

If leakage develops around the blowpipe valve stems, tighten the packing nuts, and if necessary, repack with new asbestos cord packing soaked in glycerine. Be certain to USE NO OIL.

If the blowpipe passages become clogged these can be cleared by blowing oxygen backward through the blowpipe. To do so, remove both hose, put in the largest size welding head, hold the oxygen hose over the end of the tip, and blow oxygen at about 20 lb. pressure backward through the blowpipe, first with only the acetylene valve open and then with only the oxygen valve open. (Note:—This specialized purpose is the only exception to the universal rule that oxygen should not be used as a source of pressure or a cleaning jet. Oxygen is preferred for cleaning blowpipe passages at the rare intervals when this is needed because ordinary compressed air contains considerable oil and moisture. Be sure all hose is disconnected from the blowpipe.)

If the tips become clogged, unscrew them and use a soft copper or brass wire to open the passages. Never use a sharp, hard tool.

Equipment should be inspected at frequent intervals by a competent operator. Use only standard parts on repairs to apparatus.

J. *Hose.*

Oxygen and acetylene hose should be of different colors, and should not be interchanged. A suitable clamp should be used for making the connections to the blowpipe and the regulator. It is most important that these connections be tight.

Exceptionally long lengths of hose should be avoided. When these must be used, care should be taken that the hose does not become kinked or tangled and that it is protected from damage.

No white lead, oil or grease, or other pipe-fitting compounds should be used for making tight joints.

Leaks should be repaired at once by cutting the hose and inserting a union. Leaks not only waste acetylene and oxygen but are a source of danger. Acetylene escaping from hose is likely to become ignited and start a fire, or set fire to the operators' clothing.

(*Continued on Data Sheet No.* 611)

THE FOUNDRY DATA SHEET, FEBRUARY 15, 1926

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

Around the World with The Foundry

Little Journeys to the homes of our readers

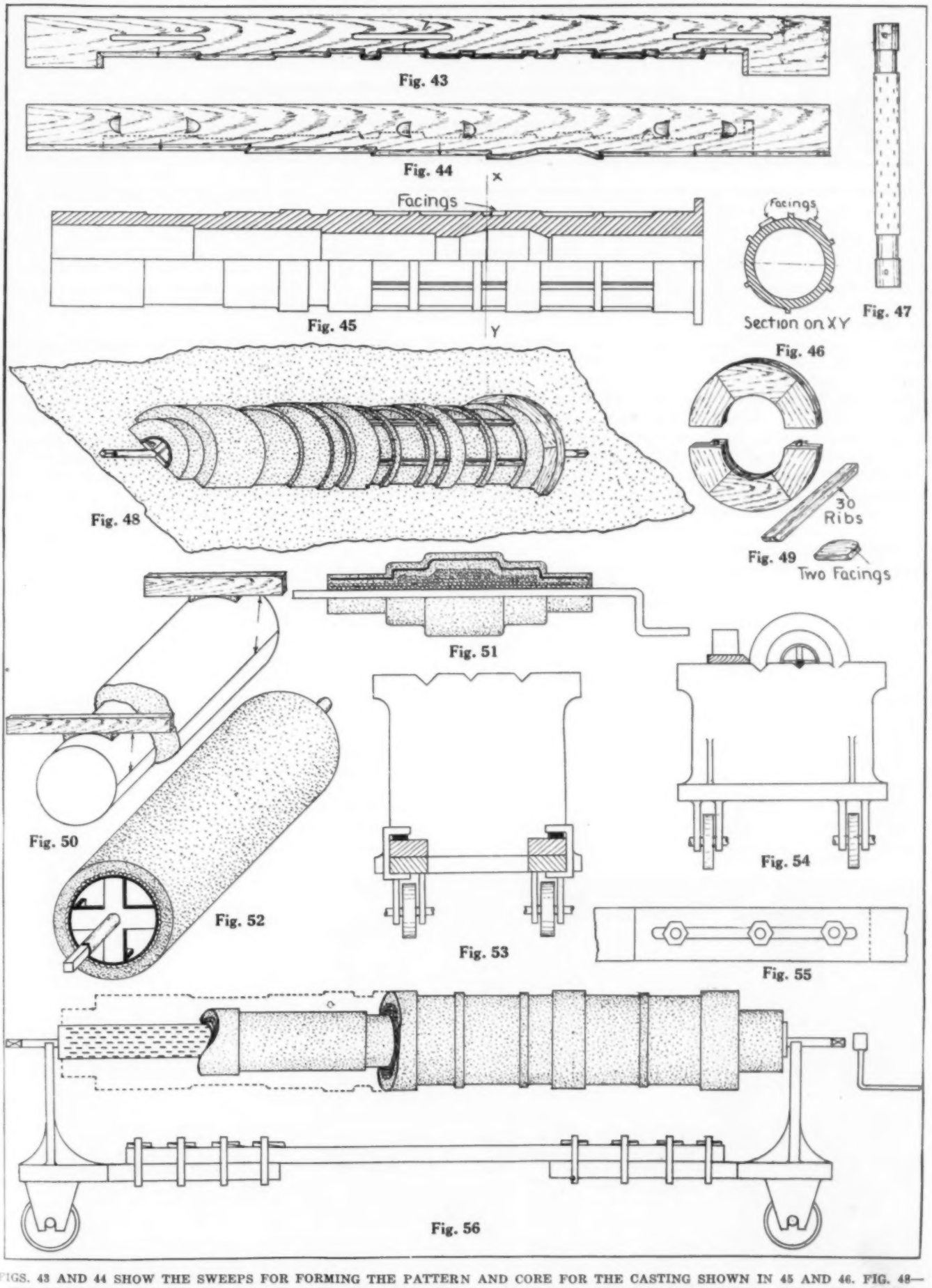
New Zealand

RETURNING leisurely on the second leg of a three-year cruise planned originally as a scientific expedition to Tahiti where the transit of Venus was observed, Captain Cook sailed completely around the two islands comprising New Zealand. He charted the coast accurately as confirmed by later surveys and disposed of the theory held up to that time that the land was a continent extending into the Antarctic regions.

Desire to escape from social, religious and economic conditions and to enjoy a fuller measure of personal liberty, prompted the first party of colonists to brave a journey half way around the world into the lonely South Pacific containing this antipodean outpost of the far flung British Empire. Later the discovery of gold and other supplementary causes fostered immigration from the old land to such an extent that today the population approximately is 1,000,000.

Several active volcanoes and extensive mountain ranges render a considerable area of the country uninhabitable, but in the four principal cities and in several of the smaller towns, manufacturing, including the production of castings for gold and coal mining, agriculture and transportation, is carried on extensively. Contact with the outside foundry world in the shape of any worth while development in the casting industry is maintained through the columns of THE FOUNDRY, read twice a month by the staffs of 35 out of the 91 foundries in the country.

"Wherever metals are cast you'll find THE FOUNDRY"



FIGS. 43 AND 44 SHOW THE SWEEPS FOR FORMING THE PATTERN AND CORE FOR THE CASTING SHOWN IN 45 AND 46. FIG. 48—THE LOAM PATTERN BEDDED HALF WAY IN THE FLOOR. FIG. 50—METHOD OF FINDING THE CENTER LINE. FIG. 51—APPLICATION OF CORE IRONS. FIG. 56—ADJUSTABLE BOGIE FOR LONG CORES MADE FROM TWO TRUCKS WITH A CENTER MEMBER HELD IN PLACE BY CLAMPS OR BOLTS

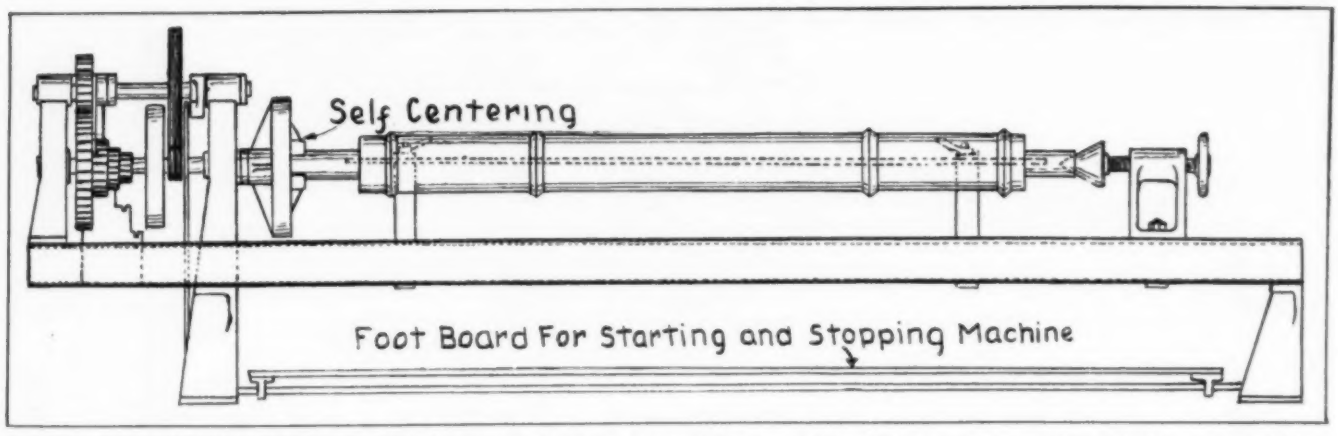


FIG. 57—LINE DRAWING OF A BELT-DRIVEN MACHINE FOR MAKING LOAM CORES IN A WIDE RANGE OF SIZES

built on and dried. Where two spindles are available the work may be expedited by building the core on one spindle and the pattern on the other.

Straw rope and loam are applied to the core barrel and the pattern is swept in the manner previously described for the core. After the finishing coat is applied, the pattern is checked at several points for dimensions before the board is removed. If found satisfactory the pattern is placed in the oven and dried. The core is swept in the same manner with the single exception that more care is observed in winding the rope and applying the loam to secure a firm and uniform covering for the barrel. This core later has to withstand the pressure of the metal. A flaw in the pattern is of little consequence, but a flaw in the core might result in a scrap casting.

Locating the Joint Line

After the loam pattern has been dried the subsidiary parts are attached in their proper positions by the patternmaker. A parting line then is marked along opposite sides to guide the molder in making his parting in the mold. Two methods for marking this line are in common use. In the first, one line is marked by using the board for a guide. The point of a trowel, the tang of a file or any sharp pointed instrument may be used to scratch a long mark from one end of the pattern to the other. The pattern then is revolved half a turn and a corresponding mark made on the opposite side. Sometimes it is possible to shift the board from side to side and leave the pattern stationary. Since the center line of the core usually coincides with the top face of the trestles it is apparent that the longitudinal line must be drawn along the under side of the sweep board. Otherwise the line would be the thickness of the board above the true center. This line may be scribed on the core either before or after it is dried.

The second method and the one most frequently employed is shown in Fig. 50. Two parallel straightedges are adjusted at opposite ends of the pattern until they are *out of wind*, which is a foundry term meaning in line. A distance representing half the diameter is measured vertically down from the straightedge. From the points thus obtained a line is drawn on either side. The straightedge may be employed for a guide or a chalk line held at each end may be snapped against the surface.

Set Loose Pieces

With the joint lines for a guide the flanges, ribs and facings may be attached and fastened in their proper positions. The various nails holding these parts in place are allowed to project so that they may be removed easily after a sufficient quantity of sand has been rammed around the parts to hold them in place. The completed pattern is bedded in the floor and handled to all intents and purposes as if it is a wood pattern. The pattern as it appears at this stage is shown in Fig. 48.

Where several molds are to be made from a loam pattern it is advisable to apply a waterproof coating to prevent the loam from disintegrating under the influence of the moisture in the sand. A good coating of tar followed by a thorough drying of the pattern will serve this purpose. With reasonable care, one of these patterns may be used at least a dozen times for a perfectly satisfactory pattern.

Horizontal loam sweeping where the spindle is rotated by hand is a slow and laborious process. Engineers are inclined to ridicule the foundryman for clinging to such a primitive method as winding a rope on a barrel by hand. A little foundry experience would teach them that turning done in the foundry and turning done in the machine shop are not on a parallel base. A core barrel must be revolved at a comparatively slow speed to enable the coremaker to apply the rope and loam in a thor-

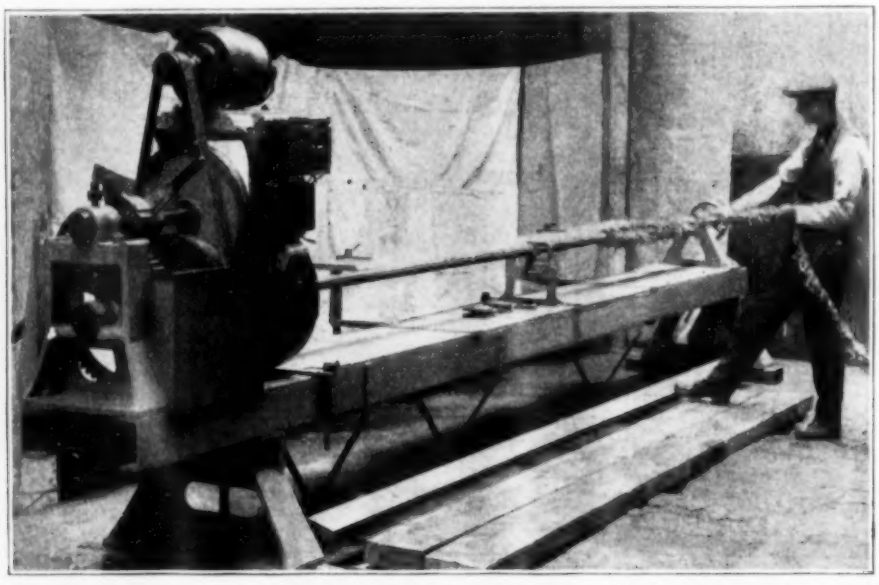


FIG. 58—THIS DIRECT DRIVEN LOAM CORE MACHINE MAY BE OPERATED AT SPEEDS VARYING FROM 12 TO 70 FEET A MINUTE. STARTING AND STOPPING ARE CONTROLLED THROUGH THE FOOT BOARD

ough manner. However, power driven machines have been developed and installed in several foundries where many large cores of a repetitive character are made. A line drawing of one of these machines is shown in Fig. 57 and a reproduction of a photograph of the machine in action is shown in Fig. 58. The machine is made by Ritchie, Hart & Co. Ltd., Belfast, Ireland, and may be driven from a countershaft as in Fig. 57 or directly from a motor as shown in Fig. 58.

With this machine only one man is needed to perform all the operations involved in sweeping a horizontal core. The output is increased and it is claimed that the cores are better and more accurate in dimension than those turned by hand.

The machine has four speeds and will swing cores from 1½ to 16-inch diameter and up to 13 feet in length. It is driven by a 1-horsepower motor. Another machine made by the same firm is capable of handling cores up to 30-inch diameter and 25 feet in length. It is obvious that with a machine of this kind a considerable saving in labor cost may be effected on large jobs like hydraulic cylinders, stern tubes and other castings with the same general characteristics. Where the machine is direct coupled to a motor through worm gearing and controller, the speed may be varied from 12 to 70 revolutions per minute depending on the size of the barrel. The operator starts or stops the machine simply by stepping on or off the foot board. The machine is equipped with a self centering chuck on the driving head and a cone on the tail end and in this manner the core revolves between two fixed centers.

Hold District Meeting

The first of a series of district meetings recently inaugurated by the Ohio State Foundrymen's association, was held in Columbus, O., Jan. 21, approximately 50 companies being represented. After a discussion on "Molding Sand" by C. F. Carson, National Supply Co., Toledo, O., various problems of timely interest to the industry were discussed, including business conditions, etc. The opinion generally expressed was that business would be good for from three to six months at least.

Gives Specifications for Fire Clay

New specifications for fireclay for the use of the various departments of the government comprise circular No. 298, bureau of standards. Methods of sampling fireclay are given and the various tests are described.

In the fineness test the sample is first washed on a No. 20 sieve, dried at 110-150 degrees Cent., and then screened. The bond test determines the bonding power by using a mortar of the clay between bricks and subjecting them to a temperature 300 degrees less than the softening point. In determining the softening point, the A. S. T. M. standard method is used. This method is designated under the serial specification number, C 24-20.

Simulated service tests are carried out in a small oil-fired furnace, one wall of which is composed of brick laid-up with the fireclay to be tested. These specifications may be secured from the superintendent of documents, government printing office, Washington, at 5 cents per copy.

Employes Form Benefit Association

SEVERAL interesting features are included in the constitution of the Berks Foundry & Mfg. Co. Employes Benefit association, an organization recently formed by the employes of the Berks Foundry & Mfg. Co., Berks P. O., West Hamburg, Pa. Each employe, upon election to the association, pays $1.00 as an entrance fee, and then pays 25 cents a week dues. The association pays a sick benefit of $10 per week for any period not exceeding 20 weeks in one year, $100 death benefit for the member and $50 to be paid the member on the death of his wife or a child. Any member leaving the employ of the foundry is entitled to a refund of the amount of money paid in, less the proportional amount paid in benefits, plus 2 per cent interest. A member may borrow up to 90 per cent of the total sum paid in at 6 per cent interest.

The association was not formed to make money, but to provide financial assistance to the members. Seventy five per cent of the total number employed were present at the first meeting, and each man present joined the association. At the end of the first month of the existence of the association, 95 per cent of the employes were members of the association, while in the one month sick benefits were paid to two men and the association had nearly $200 in the treasury. The members of the association are shown in the accompanying illustration.

Easily Made Device Aids Pouring

Two Movable Parts Hold Crucible in the Shank

CRUCIBLES when new, set high in the ring of the pouring shank. This is due to the low bilge of the crucible which is made in this manner to allow for the wear and reduction in diameter caused by the erosion and abrasion of the surface by flame, fuel, tongs, etc. To prevent the crucibles falling out of the shank during the pouring period, men hold them in place with a bar or hook, or some sort of a holding mechanism is employed. A simple, yet positive acting device is used in the brass foundry of the Hills-McCanna Co., Chicago, for holding the crucible during pouring. This is shown in the accompanying illustrations.

The device has but two moving parts and requires little effort and time to attach or detach from the crucible. The close-up view Fig. 2, shows the mechanism plainly. The parts consist of a hook bar which has rack teeth along the back. These teeth may be cut or molded, whichever is the more convenient. The dog which engages the teeth of the rack, is made with an overhang which forces the point of the dog against the rack. The hole through the dog may be cored or drilled and is placed at the end opposite the overhang. Two fittings of bar stock are shaped to fit the shank and holes drilled to take the various bolts. These fittings carry the dog and also provide a guide for the hook bar. The hook bar and dog may be made of iron, steel or even brass or copper. If of the latter metals, they may be used with the regular scrap when worn out. These parts also could be made in the brass foundry.

To attach the device, the hook bar is dropped in the guide and the dog automatically holds it in place by engaging a tooth. After pouring, the overhanging part of the dog is lifted and the bar is removed easily.

Wheatley Bros., Kansas City, Mo., manufacturer of brass, bronze and aluminum castings, has opened a branch plant at Tulsa, Okla., in charge of M. F. Hampton, formerly in charge of the Los Angeles branch.

Personnel Is Changed

Several changes in the executive personnel of the Timken Roller Bearing Co., Canton, O., recently have been made. Ernest Wooler, formerly automotive engineer, has been made chief engineer, being in charge of automotive, industrial, experimental and service engineering. J. W. Spray has been made manager of sales of the automotive department, while E. W. Austin and R. W. Ballentine have been made assistant managers of sales of the automotive department. Peter C. Poss has been appointed assistant advertising manager.

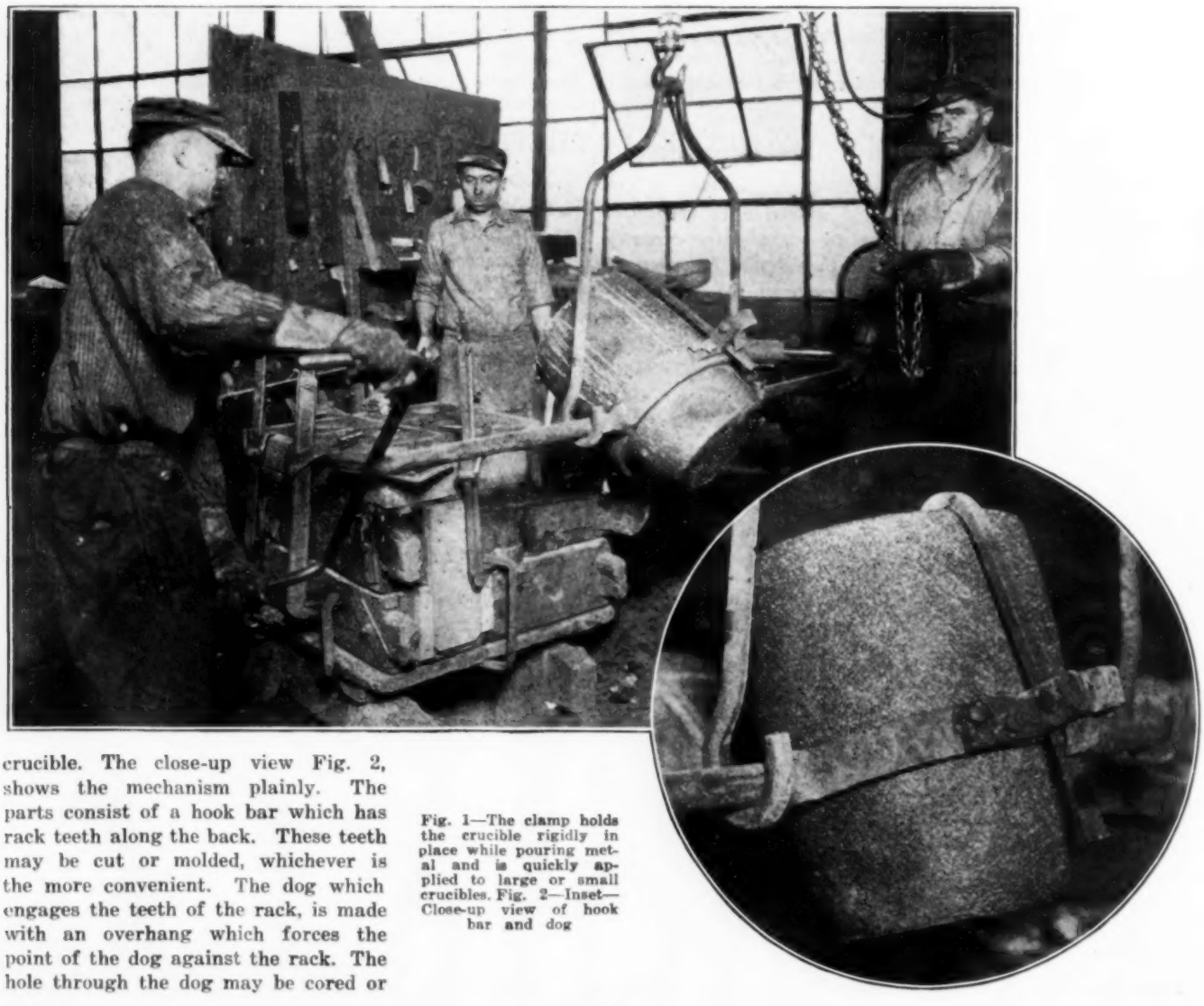


Fig. 1—The clamp holds the crucible rigidly in place while pouring metal and is quickly applied to large or small crucibles. Fig. 2—Inset—Close-up view of hook bar and dog

How and Why in Brass Founding

By Charles Vickers

Advises Machine Made Sand Cores

We would appreciate your suggestions as to the present practice in making and using green sand cores on radiator valve body castings and similar work. We understand this method is used considerably, but we do not understand how it is better than using regular dry sand cores.

There is no advantage in making green sand cores for valves of any kind, or for castings of any kind that do not leave naturally their own cores. Such cores as valves and faucets are turned out like hot cakes on machines and require no venting, and very little rodding. In spite of this fact there may be people riding the hobby of green sand cores, but in our humble opinion they are not making money at it. In the days of hand made cores, with their strengthening wires and their vents, there might be a chance for the green sand core for such work, but that time has passed since the advent of the core blowing machine. If the inquirer is using hand methods for making his cores let him tread the path of progress by getting acquainted with the manufacturers of core making equipment, and as a means to that end we suggest a study of the advertising pages of THE FOUNDRY.

Scale Forms on Bar

We are sending you two pieces of scale which came off the top or cope side of bronze bars cast horizontally. We make two bars in a flask, and the scale is from one 2¼ inches diameter; its companion showed no scale. The small piece of scale sent you is taken from the upper part of a round bar 2½ inches diameter, the alloy being copper 90 per cent; tin 5 per cent; zinc 5 per cent, with a touch of manganese. There were two in this flask but both came out scaled. Other similar castings, but smaller, in the same heat came out perfectly clean. Often the surface under the scale is smooth and sound and other times it is pitted. The same thing happens when the bars are cast on end. It will commence just a little below the top and extend down a couple of inches or more.

The reason this scale forms is that the sprue is too small for the diameter of the casting; the sprue solidifies first externally; its heart is kept open by the heat dissipated from the casting. The latter shrinks, of course on top, and next the gate and the partially hardened film of metal next the sand falls in, then the pressure from the molten interior of the sprue breaks through the solidified film seeking to fill up the vacancy that has been formed. That forms the scale, it fails to adhere to the metal underneath because the latter carries a *parting* formed by the oxide coating from contact with the sand of the mold and produced by the air within the pores of the packed sand.

The remedy is simple. Put a riser to each heavy bar and have the risers ¼ inch greater in diameter than the bar they feed; two bars to a flask need two risers close to the ends of bars. A small sprue is put between the risers and gates. The gate from riser to bar should be nearly full size of bar; fillet it slightly and break off hot; carry the riser at least 4 inches higher than top or bars. This will give the necessary head of metal.

Desires Hard Alloy

We are desirous of making a lead, or other high specific gravity alloy, which will approximate in hardness that of hardened steel and would be pleased if you could give us any information on the subject you may have.

It is a certainty that lead in no form or alloy can be used to make an alloy as hard as steel, therefore, although this element is noted for its high specific gravity we can dismiss it from consideration.

Ferrotungsten is noted for its high specific gravity, and it is also hard, but it is doubtful whether enough of it can be alloyed with copper to produce a nonferrous alloy of great hardness and specific gravity. It alloys with iron, nickel or chromium, therefore it would appear at first sight that an alloy of tungsten, chromium and nickel should be the object of research. What proportions should be used we are not prepared to say but to a person experienced in doing research work in connection with alloys, it should not be such a difficult problem to solve.

Brass Casting Process

We have made a number of liners and have experienced much trouble on account of porosity after machining the castings. We melt in natural draft coke-fired furnaces and use the following mixture: Scrap copper wire 33 1/3 pounds, tin 9 pounds, zinc 1 pound, scrap trolley wheels 56 2/3 pounds, with the addition of a small piece of phosphor copper to every pot of 300 pounds of molten metal. Can you give us an idea as to the cause of the difficulty?

The only way in which the composition of the metal could be obtained is by analysis, and we suggest that one be made, if only for educational purposes. If the scrap trolley wheels are all of the same composition, have them analyzed. Then it will not be necessary to alloy by rule of thumb, for the necessary additions may be made to bring the composition to whatever is desired. The trolley wheels may contain no zinc, in which case one pound of zinc to the hundred pounds of metal, and about one ounce of phosphor copper to 300 pounds of metal is not sufficient to ensure sound castings, no matter how much care is used in melting. The addition of tin will not ensure solidity if a small heat is made for a trial and 1 per cent of zinc is added, simply casting copper, and then a little phosphor copper is added it will be found the copper will *cauliflower* at the sprues and risers after pouring.

It is advisable to melt all copper and add tin, lead and zinc as required. Try working to the following mixture. Melt 86 per cent copper. For a 300-pound heat this would be 258 pounds of copper; put 6 ounces of phosphor copper in the bottom of the pot, get fully liquid under charcoal then add 6 pounds of zinc; 12 pounds of lead and 24 pounds of tin; making the alloy; copper 86 per cent; tin, 8 per cent; lead 4 per cent; zinc 2 per cent. If the mold is made and gated correctly the castings will be sound.

The use of scrap metals is much more expensive than all new metals, when the scrap makes bad castings which have to be recast again and again. The use of all scrap may seem cheaper in first cost, but the recasting of poor castings is an expensive proposition.

Observe Centennial

Recognition of Seth Boyden, the Inventor of American Malleable, Marks Hundreth Anniversary of Prosperous Foundry in Newark

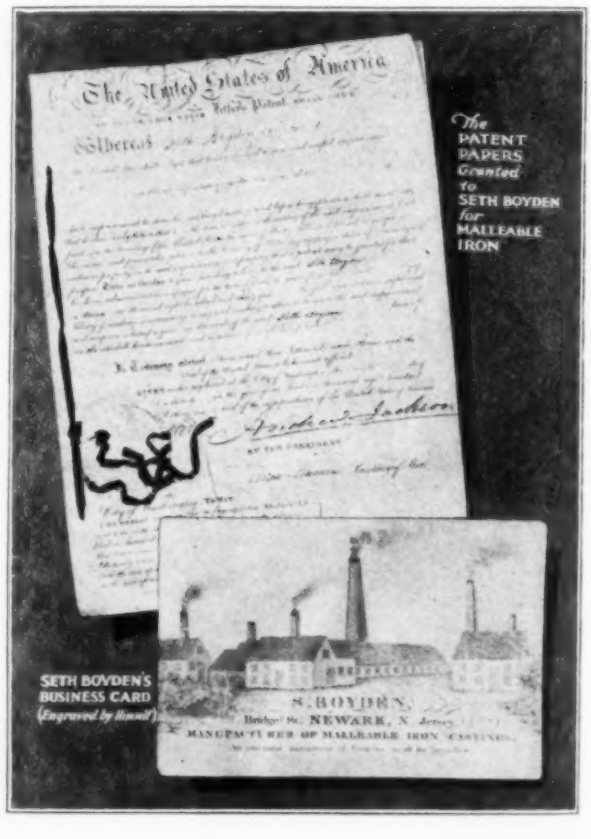
Seth Boyden, known to the Foundry Industry for his Discovery of Black Heart Malleable Iron Was the Most Noted Inventor of his Age

SETH BOYDEN, discoverer of black heart malleable iron, was given recognition at a dinner held in Newark, N. J., Jan. 27, by the Barlow Foundry Inc., for the dual purpose of celebrating the rounding out of 100 years of continuous existence and of marking the centennial anniversary of malleable, to which the Barlow company owes its origin. The occasion was featured by the bringing out of details which showed that this particular feat was only an incident in Boyden's career.

"What a man was Seth Boyden!" Thomas A. Edison wrote in a letter quoted at the dinner, "Seth Boyden was one of America's greatest inventors and one who never has received proper credit for his many great and practical inventions. They have been the basis of great industries which have spread over the entire world and given employment to millions of people."

He was born in 1788 at Foxborough, Mass., and as a boy showed unusual traits. At the age of 15 he repaired watches and made a telescope, a microscope, an airgun and a rifle. Three years later he painted a miniature of himself on ivory and engraved a portrait of Washington. In 1810 he constructed a machine for making wrought iron nails, another for making brads and files and another for cutting and heading tacks. He next invented a machine for splitting hides, and this machine still is used to split bookbinders stock. In 1815 he settled in Newark, N. J., and opened a harness shop. The following year he placed his brad and tack machines in operation at Newark. In 1818 glazed and enameled leather first came to his attention. He analyzed the varnish on the leather and soon produced the superior article, which ever since has been known as patent leather. He did a good business in patent leather for those days. In 1822 he realized $4,521 from its sale and by 1829 this business had increased to $20,341 for that year. In 1831 he sold the patent leather factory as his interest had been extending in another direction. Incidentally, the manufacture of patent leather continues today one of the most important industries in the city of Newark. For about six years Boyden conducted experiments in an effort to develop malleable iron similar to that made in England by secret methods. At that time, owing to the brittleness of cast iron it was necessary to go to the expense of forging many articles out of wrought iron and what Boyden wanted primarily was an ideal metal for casting harness hardware. In his boyhood he occasionally had assisted at a blast furnace operated by his grandfather and it happened that on one occasion when the hearth was being repaired he discovered that part of a cast iron bar which long had been imbedded in the hot brick work had become annealed and could be worked on an anvil. His experiments came to a successful conclusion in 1826. On July 4th of that year, while the citizens of Newark were celebrating Independence Day in a near-by park he ran off his first heat of malleable.

It is of interest to note that the Franklin Institute of Philadelphia in 1828 awarded Boyden a premium for an exhibit of buckles and other malleable castings. In describing an improved firing process which he developed at his malleable plant in 1831,


The United States of America
Whereas
Andrew Jackson
The PATENT PAPERS Granted to SETH BOYDEN for MALLEABLE IRON
S. BOYDEN,
NEWARK, N. Jersey
MANUFACTURER OF MALLEABLE IRON CASTINGS
SETH BOYDEN'S BUSINESS CARD (Engraved by Himself)

A Patent Was Granted Under the Administration of Andrew Jackson. This Still Is Preserved as a Relic of the Founder of the Barlow Plant. The Business Card of Seth Boyden, Engraved by his Own Hand Carried a View of His Foundry

the inventor said: "The improvement consists in mixing rosin, pitch, or tar, with the bituminous coal and applying it as fuel for melting castings. The coal is pulverized or broken in pieces of a size suited to the furnace grate and mixed with rosin, pitch, or tar, in a proportion as the intensive heat is desired and applied in quantities, diminishing in proportion as the rosin is increased."

His Busy Years

About 1837, Boyden, again interested in other directions, sold out the malleable business for $25,000 to a Boston firm which conducted the business as the Boston Malleable Cast Iron & Steel Co. Mr. Boyden then engaged in the manufacture of steam locomotives. He built the locomotives, *Orange* and *Essex* for the old Morris & Essex Railroad Co. These locomotives were built respectively in 1837 and 1838. In 1841 he built an engine for the Cardenas Railroad of Cuba and then went to Cuba to place it in operation. His interest then was diverted to stationary steam engines and in 1845 he built an engine for the use of the Newark Lime & Cement Co., at a contract price of $1,000. This engine now is in a museum in Newark. At that time he applied for a patent on a cut-off for steam engines, to be used in place of the throttle valve and to be connected with the governor. His application was rejected because he neglected to send a model to the patent office and as a result his invention became common property.

He undertook the problem of reducing the zinc ores of New Jersey after others had failed on it and in 1848 he discovered an economical process for obtaining zinc from this ore. In 1849 he caught the gold fever and went to California but returned to Newark the following year, where a celebration was held and cannon fired to welcome him back home. Soon after he discovered an inexpensive process of manufacturing Russia sheet iron.

About 1855 he practically retired and moved to Hilton, N. J., where he devoted his attention largely to agriculture.

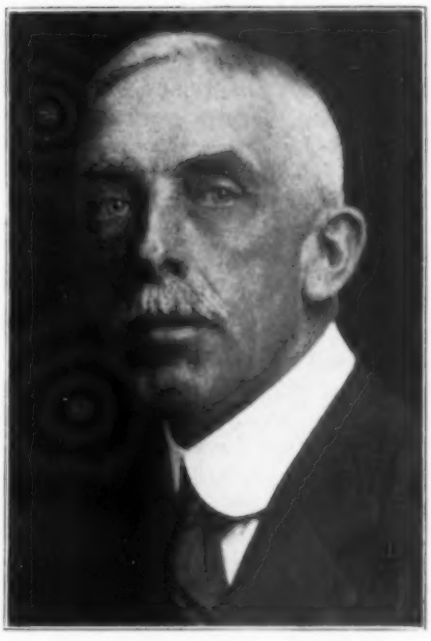
He did a great many other things too numerous to mention, and was an accomplished violinist, but lacked business ability and in his last years he worked for $1.50 a day to obtain the necessaries of life. His friends started a fund for his relief, but he put a stop to this when he heard of it. Just before his death in Hilton at 74, he remarked that he had enough experiments on hand to last two whole life times. At the time of his death he was experimenting in bronze. The citizens of Newark erected a statue of him on the spot where the cannon had stood when they welcomed him back home in 1850.

JOHN L. CARTER
General Manager of Barlow Foundry Inc.

EDWARD E. RASH
Foundry Superintendent

Several Other Men

The second outstanding figure in the long history of the Barlow Foundry Inc. was John H. Barlow. He was born in Granville, Mass., in 1806, and at the age of 20 went to work for Samuel W. Collins who in 1826 founded the Collins Co. at Collinsville, Mass. This company also is celebrating its centennial anniversary this year. Mr. Barlow first was bookkeeper and then traveled all over the country as well as abroad in selling the products of the Collins Co. Shortly after the malleable business at Newark had became known as the Boston Malleable Cast Iron & Steel Co., it had been bought by Daniel Condit and others. John H. Barlow, a brother-in-law to Mr. Condit, joined the latter in the Newark business in 1849. Shortly after Mr. Condit went into the dried fruit business. Partners changed from time to time, but Mr. Barlow was the chief figure in the business, as well as an outstanding figure in foundry circles at Newark up to the time of his death in 1894.



ARTHUR E. BARLOW

First to Use Oil in Annealing

The third principal figure in the company's history is Arthur E. Barlow, son of John H. Barlow. The present Barlow started as an employe in his father's foundry in 1887. He first learned the trade of patternmaking and became proficient. Among his treasures at present is the first gate of patterns he made, a gate of patterns still fit for use. Later Mr. Barlow initiated a number of improvements in foundry practice and was the first to anneal and melt malleable iron with oil as the fuel. Mr. Barlow is a charter member of the Newark Foundrymen's association and always has been one of its most active members. For a number of years he was president and for several years served as secretary. He has been a leading spirit in a good deal of work which is aiding the foundry industry of Newark.

Originally the plant of Seth Boyden

was located at 26 Orange street, Newark. There the business remained in continuous operation until 1914 when the company moved into a fine new plant in the Waverly section of Newark. Coincident with the removal into the new building, the company abandoned its historic production of malleable iron and since has confined its activities to gray iron castings. In recent years it has extended both its buildings and its facilities, and has made improvements particularly in the use of machine molding methods. A history of the company would not be complete without mentioning the fact that four other foundries were established in the Newark district by men who received their training at the Barlow plant.

Ancient Chinese Excel in Art Castings

(*Concluded from Page* 134)

stead of 365¼ degrees (as on the old instruments, for 365¼ days of the year) and each degree divided into six parts. The observer could read to 15 seconds by means of the diagonal scale and a movable divided vernier.

These valuable instruments were carried off to Germany by the order of the Kaiser, after the seige of Peking in 1900, a piece of vandalism that provoked such a storm of protest that replicas of them were made and sent to Peking. Since the Armistice after the World war, the original instruments have been returned to the rightful owners.

These large astronomical instruments are a fine testimonial to the skill in designing and casting as well as in astronomy of the workmen of that age. Although the astronomical features may seem crude at the present day when compared with the modern telescope, the designing and casting of such work would be hard to beat even today.

Another interesting specimen of early cast iron work is the statue of an ancient warrior shown in Fig. 1. This statue stands in the beautiful park surrounding the temple of Chin Ssu (Golden Temple) about 10 miles west of the city of Taiyuanfu, in the province of Shansi. The statue is more than life size and bears a date that shows that it was made sometime during the Sung Dynasty (A. D. 960 to 1127). The workmanship is most excellent and in spite of its exposed position rust does not seem to have affected it to any great extent. This is one of four cast iron statues at that place. The other three are of less merit, as castings. It is said that these other three were made much later to replace three that were taken away or destroyed.

This is the first of three articles by Mr. Foster describing Chinese foundry and metal working practice. The second covering the primitive iron refining methods still followed in many localities will appear in an early issue. The Editors.

Adopt Standard Invoice

Thirty-five businesses of average size recently were asked to estimate the amount which could be saved annually in clerical help if all invoices received were on the standard invoice form which has been adopted by the National Association of Purchasing Agents, and which has been officially endorsed by the Railway Accounting Officers' association, the National Association of Cost Accountants and Div. IV, Purchases and Stores of the American Railway association. The total of all replies received was $21,700, an average of $620 for each of the 35 firms. Assuming this average to apply to 25,000 largest business concerns of the country, this result indicates that the adoption of this form would result in a saving of over $15,000,000 annually. Since interest in the movement toward the adoption of this standard invoice has grown greatly, the National Association of Purchasing Agents has requested the department of commerce, division of simplified practice to call a conference of all users of invoices to consider the adoption.

Among the many organizations circularizing their members with samples of this form are the National Supply & Machinery Dealers' association, the Steel Barrel Manufacturers' association, the Foundry Supply Manufacturing association, the National Association of Steel Furniture Manufacturers, the National Lumber association, the National Machine Tool Builders association, the Toy Manufacturers of the U. S. A., and the American Iron, Steel & Heavy Hardware association.

Mining Limestone

Limestone, which finds industrial use in the United States to the extent of approximately 120,000,000 tons per year, is obtained chiefly from open-pit quarries, but with gradual depletion of surface deposits, operators are being forced to use underground methods. As quarrymen are not necessarily familiar with underground mining, a complete study of the mining of limestone in this manner has been made by engineers of the bureau of mines, department of commerce, with the object of determining the methods in use, ascertaining what constitutes good and bad practice, and suggesting improvements in methods when practicable. As a result, complete data were obtained, with the hearty cooperation of the industry, on 52 of the 64 mines known to have underground workings. The information obtained by the bureau of mines will be embodied in publications to be issued within the comparatively near future.

Lists Electrical Tools in New Catalog

Portable electric drills and grinders have become a necessary adjunct to the modern foundry and machine shop. These tools save many steps, and sometimes considerable labor that would be involved in moving the material.

That the buyers of such equipment may become acquainted with its product, the United States Electrical Tool Co., Cincinnati, has issued a 53-page catalog describing drills and grinders. The drills are direct connected to either alternating or direct current motors, and range in size from those equipped to take a ¼-inch drill to those that take an 1½-inch drill. Portable electric screw, nut and stud drivers also are shown. Portable bench and lathe attachment grinders are described. The lathe type may be obtained for either surface or internal grinding. Large sizes of grinders and polishers with motors up to 7½ horsepower may be had in the floor stand type. The catalog is well illustrated, and the size and specifications of the various tools given.

To Visit in Europe

E. O. Beardsley and W. F. Piper, of the Beardsley & Piper Co., Chicago, sail from New York, Feb. 20, for a 3-month trip to England, Germany, Belgium and France in the interest of their sand throwing machine. They will inspect plants in Scotland and Germany, in which this type of machine now is manufactured, and will make arrangements for production in France. Foundries in which sand throwing machines are used also will be visited.

The Reading Chain & Block Corp., Reading, Pa., has opened an office in Pittsburgh, 327 First avenue, in charge of Lloyd W. Lutz.

Long Life Mold Temperatures Regulate Casting Properties

Cooling Velocity of Permanent Mold Accelerated or Retarded To Secure Decided Hardness Characteristics of the Castings

By H. A. Schwartz

WHEN pouring castings of smaller section or lighter weight at shorter intervals, the effect of the control apparatus on the established temperature range merely is to bring such a range within closer limits. The input of heat units into the mold may not be sufficient at each pouring to cause the valves to open wide, but undoubtedly, there is a sufficient heat input to cause some valve action. This also is true during the interval of time between pourings, and although the valves may not close to a great extent, they are actuated to some degree. It is possible that for certain light castings of certain shape, the valve action, with a given fluid flow, would be slight throughout the period of casting.

The mold cavity walls, separating the fluid chambers from the cavity surfaces, should be as thin as it is practical to make them to have as sensitive and as prompt a response between heat absorbing fluid and mold as possible. The reason for this is obvious. As a rule, the cavity walls of the mold sections in contact with thicker casting section are of lesser mass in proportion to the casting mass than the cavity walls of the mold sections in contact with thinner casting sections. This is due solely to constructional limitations; it being impractical to maintain the mold cavity wall thickness in the several mold sections in exact proportion to variations in the casting material distribution, although this is done as far as possible, and is aided by the use of cooling fins and various other heat conductive materials. Therefore, it is possible that the mold cavity walls transmit the heat input from the lighter sectioned castings in a more sluggish manner than the mold cavity walls for the thicker sectioned castings. This condition, on one hand tends to decrease the mold temperature range, and on the other hand, it tends to increase the temperature spread over the mold surfaces.

When molten material is poured into a mold the immediate mold cavity surfaces do not take the molten material temperature as some might suppose. The surfaces of the mold cavity are finished smooth, and when examined through a microscope, show a well defined cellular structure; the harder constituents of the metal, forming the mold, being distributed in such a manner as to form the cell boundaries. As a result of this distribution of the constituents, the cavity surfaces possess more or less irregular contours, the harder constituents standing in cellular form in relief above the softer matrix. The small surface recesses are filled with air or foreign substances. When the molten material is introduced into the mold, this air or foreign substance immediately gasifies and serves as a protecting film which is not broken down, if at all, until after the molten material has solidified; the circulating heat absorbing fluid virtually eliminating an accumulation of heat at the mold cavity surfaces. This principle will be recalled when it is remembered that a person may immerse his finger in boiling water or steam for an instant and not suffer any ill effect due to the film of protecting moisture and air around the finger.

The heat absorbing fluid chambers in each of the several mold sections are designed to give a maximum heat absorbing efficiency. A mold may be made with any number of sections, depending mainly on the casting design, gating and venting requirements. A long casting may require two or more mold sections bolted together longitudinally, with the purpose of minimizing possible warping and shrinkage resulting from thermal reactions in both casting and mold. Also each mold section may have more than one fluid chamber, if the casting material distribution makes this desirable.

In many cases, especially where the casting mass is sufficiently great, the inner faces of the cavity walls extending into the fluid chambers are arranged with fins, webs, materials of high heat conductivity, etc., to provide a maximum cooling surface to the heat absorbing fluid, to break up the heat insulating fluid films which tend to form on the inner mold surfaces, and to help create a turbulent condition of the fluid flow as it circulates through the fluid chambers. The size, shape, weight and the material of the casting influence the design of the mold as to the number of sections, type of parting, gating and venting design, and other important elements of the mold construction. Although general design and constructional data already have been determined, each new casting presents certain special problems of mold construction.

It is well known in the foundry art that the hardness characteristics of the iron-carbon alloys are determined largely by the amount of carbon precipitation which takes place as the forming casting solidifies and cools to and through the critical point, this point in cast iron being about 1400 degrees Fahr. The elements in-

(*Continued on Page* 149)

Controlling Casting Hardness

THE relation of the rate of cooling of the casting in the permanent mold to the hardness characteristics of the casting, has been a problem receiving considerable attention by the various investigators of the long life mold process. In this article, which is the third of a series of four, the author explains the effect of cooling both before and after ejection from a permanent mold of his invention. The application of this process on a profitable commercial basis also is discussed. In the first of this series, which appeared in the Jan. 15 issue on page 42, the early developments in the permanent mold process were treated, while in the second article which was published in the Feb. 1 issue on page 92, the various phases of mold deterioration were discussed.

Compares Gray Iron Structure

FIG. 1—PHOTOMICROGRAPH OF OUTSIDE OF SAND-CAST BAR

A COMPARISON between the structure of gray iron cast in sand molds and in cast iron permanent molds, which were cooled by oil, recently was made by William Campbell, professor of metallurgy, school of mines, Columbia university, New York. The report of Dr. Campbell is abstracted as follows:

That the strength of cast iron is determined by the structure now is an accepted fact. When we examine various gray cast irons, a wide variety of structures is found, but it is soon noticed that this is made up of three main variations, namely, amount and size of the graphite plates, the nature of the steel matrix, the amount and distribution of the phosphide. The graphite is the most important, of these three variables, the steel matrix coming next, while the phosphide plays the least important role. The main factors controlling the graphite are composition and rate of cooling during and after solidification. As regards composition, in ordinary gray cast iron, the silicon and the carbon contents are by far the most important.

The steel matrix varies with the amount of combined carbon and may consist of ferrite alone, ferrite with variable amounts of pearlite or pearlite alone. This variation is controlled mainly by the silicon content, though rate of cooling plays an important part. The amount of phosphide, of course, depends on the phosphorous content while its distribution is controlled mainly by the rate of solidification.

Hence it follows that for a given composition the chief variable is the graphite which may be controlled by the rate of solidification and subsequent cooling.

In the case of sand cast pig iron or large gray iron castings, the graphite plates are of enormous size, and are quite visible to the eye in the fractured surface. The metal has low tensile strength in consequence. The smaller the casting, the more rapid the rate of solidification and subsequent cooling, and the finer are the graphite plates and hence the stronger the metal. A further improvement may be made by reducing the amount as well as the size of the graphite plates, as in so-called semisteel where the plates of graphite are small and evenly distributed in a matrix of pearlite, resulting in a tensile strength of often over 40,000 pounds per square inch. This may only be brought about by reducing the total carbon content to 3 per cent or less, usually by the introduction of steel scrap.

The finest structure occurs in metal which solidifies rapidly, but if subsequent cooling is too rapid, the formation of white cast iron or chill may occur. If we can cause the metal to solidify as rapidly as possible and then cool it comparatively slowly, a gray iron of fine texture and high strength will result. It has long been known that practically all gray irons solidify as white cast iron and at lower temperatures, depending on the rate of cooling and silicon content, the combined carbon changes into graphite. Recent experiments seem to show that other things being constant,

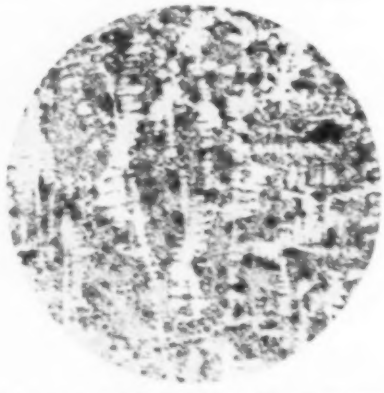
FIG. 2—PHOTOMICROGRAPH OF CENTER OF SAND-CAST BAR

the rate of cooling through the cherry red heat controls the chill, a minimum rate being necessary to produce the metal gray throughout. If this minimum time is not allowed, the metal shows a chill.

This is shown clearly in the case of centrifugal cast iron pipe, which if cooled in air on withdrawing from the mold, shows a decided chill, but when slowly cooled through the cherry red heat, is soft throughout. Due to the fine texture of the graphite, its tensile strength, is far in excess of that of sand cast pipe.

A similar thing occurs when permanent molds are used. If the mold is cold, a chill is produced, but with use, the mold heats up and the thickness of the chill decreases. If the mold gets sufficiently hot the cooling is slow enough to cause all of the chill to disappear. Of course, a further increase in the temperature of the mold causes a coarsening of the graphite due to slower freezing of the metal. Hence if we can determine the best temperature at which to keep the mold, so as to produce an iron with the finest texture and yet avoid a chill, our problem will be merely to keep that temperature constant. This has been done in

(*Concluded on Page* 149)



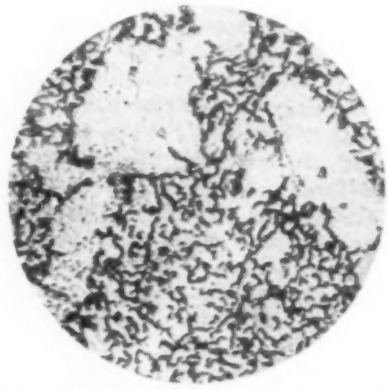


FIG. 3 PHOTOMICROGRAPH OF OUTSIDE OF BAR CAST IN PERMANENT MOLD. FIG. 4—CENTER OF BAR CAST IN PERMANENT MOLD. FIG. 5 SECTION SHOWN IN FIG. 3 ENLARGED 500 DIAMETERS

Compares Gray Iron Structure (Concluded)

(*Concluded from Page* 148)

oil-cooled permanent molds by keeping the circulating oil at a definite temperature.

The following micrographs, magnified 90 diameters, show the difference in structure of two test-bars 1 5/16-inch in diameter one cast in sand, the other in an oil cooled permanent mold.

Fig. 1 shows the outside of the sand cast bar. The graphite plates are fairly large, and are so distributed that the iron is comparatively weak.

Fig. 2 shows the center of the bar where the plates of graphite are extremely large.

Fig. 3 from near the outside of the bar cast in the permanent mold. The structure is entirely different. White dendrites occur in a matrix in which the graphite is so fine that it barely is visible at this magnification.

Fig. 4 shows the center of the bar where a mixture of coarse and fine areas occurs. The coarsest of the graphite is no coarser than that at the outside of the sand cast bar, Fig. 1.

Fig. 5 magnified 500 diameters, illustrates the fineness of the graphite plates seen in Fig. 3.

A further difference occurs in the steel matrix. In the sand cast bars in Figs. 1 and 2, the matrix is pearlite with a small amount of ferrite. In the permanent mold bars, the matrix is mainly ferrite with silicon in solution, as shown in Fig. 5, and the combined carbon is, of course, lower than in the sand cast metal. Hence we must conclude that the matrix of the sand cast metal is much stronger. But this strengthening of the sand cast steel matrix is so over shadowed by the weakening effect of the coarse graphite plates that it is a minor factor in determining the strength of the two metals.

(*Continued from Page* 147)

fluencing carbon precipitation are, first, the rate of cooling velocity of the casting, and second, the composition of the casting material. Generally speaking, if the cooling velocity could be retarded sufficiently through the solidification and critical points, the carbon content would be precipitated entirely into its free state regardless of the casting composition. As the time for cooling through this period is shortened, less and less graphitic carbon is precipitated.

Silicon Effect Important

Changes in composition promote or retard the precipitation of free carbon; the constituent having the most important effect in this respect being silicon. The mold is naturally a good heat conductor and has a relatively rapid cooling action upon the molten material introduced therein. If castings of softer characteristics are required, a suitable cooling velocity of the forming casting is established by stabilizing the mold temperature of a higher level and, in certain cases, by coating the mold surfaces with a proper thickness of refractory material. If castings of harder characteristics are required, the cooling velocity of the forming casting is accelerated by establishing the mold temperature at a lower level. Of course, the composition of the metal being cast is prepared in accordance with its hardness requirements; for softer properties, a composition which naturally promotes carbon precipitation; and for harder properties, a composition which naturally retards carbon precipitation. However, even with this regulation, it is impractical to obtain uniform results as to hardness characteristics of castings produced in the permanent mold, without the following further regulation.

As previous stated, the natural tendency of a permanent metal mold is to accelerate greatly the cooling velocity of a forming casting. Therefore, it may be understood readily that unless each forming casting is dissociated from the cooling influence of the permanent mold at substantially the same point in temperature as the casting cools through the solidification and critical points, great variations in the hardness properties of the castings produced will result. The castings remaining in the permanent mold longer will have harder properties, as less carbon will precipitate due to the longer period of rapid cooling. To obtain predetermined hardness characteristics in a casting, it should be dissociated from the mold at a predetermined point of the casting temperature. This casting temperature point of dissociation from the mold is higher if castings of softer properties are required, and lower if harder properties are required.

Depending upon the cross section and distribution of casting material, and depending upon whether more or less carbon precipitation is desired, the newly formed castings on separation from the mold may be allowed to cool further down through the critical point at a normal rate by cooling in the air, at a subnormal rate by cooling within a loose refractory material or within an airtight receptacle, or at an abnormal rate by immersion in a suitable liquid or by coming in contact with a proper air or gas current. It even may be desirable, in certain special instances where the casting has a thin cross section and is to be used under particular conditions, to send the castings as they are ejected from the mold through an annealing furnace for a short period, seldom more than an hour or two, as an normalizing action to remove possible skin chill or hard spots. The cost of this normalizing operation never is more than a fraction of a cent per pound, and, under certain conditions, is well worth the cost.

Time Element Essential

From the foregoing, it may be seen, that it is highly desirable to separate each casting from the mold at a given casting temperature, to obtain a uniform hardness characteristic in each casting produced. Knowing the practical difficulties of maintaining the molten metal temperature and composition within substantially constant limits, and knowing the practical difficulties in maintaining a more or less uniform rate of pouring the molten metal into the mold as to velocity and volume, it may be seen that each casting may cool at a varying rate while in the mold. This varying cooling rate precludes the use of the time-lapse method of ejection from the mold; where each casting is ejected from the mold after the lapse of a predetermined time interval after the mold had been filled with molten material. The new process provides a sure but practical method for causing the separation of each casting from the mold when the casting reaches a given temperature point. The process provides a thermal or an electrical contact on the mold cavity surface, which makes a physical contact with the forming casting. This thermal or electrical contact is actuated when the casting reaches a predetermined temperature point, and, either causes the registration of the proper ejection period or automatically initiates the ejecting mechanism operation. In this way, the new process insures an exact but practical separation of each casting from its mold at a given casting temperature; assuring a run of castings with each casting having substantially the same hardness and general structural characteristics.

Evils, due to phosphorus, sulphur, and other elements, are not due so much to these elements in themselves, but are the result of segregation in colonies of these elements in the casting structure. By rapid solidification in the mold, the molten material forms a casting with a structure in which segregation has been minimized and which has an extremely dense fine grain. By ejecting the newly formed casting from the mold soon after solidification and then allowing it to cool slowly at a controlled rate down through the critical point, the carbon precipitates to a sufficient degree to form a soft machineable casting; each casting in the run identical with the other in this respect.

Varying degrees of hardness in the same casting may be obtained by establishing separate mold sections at the different desired temperatures and, in certain cases where the soft casting surfaces are required, further retardation of velocity of heat conduction is accomplished by coating the necessary mold surfaces with a proper thickness of refractory material. Then the harder faces of the casting are allowed to remain in contact with the corresponding mold sections for slightly longer periods than the remaining casting surfaces. This means is utilized when it is desired to cast parts with surfaces that are subject to great wear and require little or no machining; and example of such parts being certain members of agricultural machinery.

Obtain Fine Grained Structure

The casting made by the process, because of rapid solidification, has a fine grained dense structure with the various elements in a finely distributed state. One peculiarity of the structure of these castings is that the free carbon is in a fine granular form, different from the large graphitic flakes usually found in sand cast castings. The new process casting has physical properties that differ greatly from the sand cast cast iron. It really has a great many of the better properties of both gray iron and malleable iron.

In comparison tests, taken from test pieces as well as from castings made by casting from the same ladle of molten iron in sand molds and by the new process, it was found that the new process casting had a deflection, a transverse break and an ultimate tensile pull of over twice that of the sand cast iron. Ultimate tensile pulls of over 53,000 pounds have been obtained from the castings of this type. Gray iron castings made by the new process, even when the so-called poor grades of cast iron are used, are absolutely nonporous, due to the closing up of the cellular structure by the rapid solidification.

With all of this great improvement in structural density and physical properties, the casting made in the permanent mold is extremely easy to machine. Under production conditions it has been possible to machine cast iron poured in this process at a rate of over 200 feet per minute; the cutting tools standing up for longer periods than before found possible. The finely divided form of the free carbon undoubtedly has much to do with the ease of machining and increased life of the cutting tools. The use of baked sand cores to form internal recesses in the casting does not seem to have an effect on the improved grain structure of the new process casting.

These castings naturally are extremely uniform as to dimensions, due to the permanent character of the mold. This is another great element effecting saving in machine costs.. Also, the surfaces of the castings made by this process do not have the surface scale, so well known in sand cast iron. All these qualities make it possible either to decrease the machine costs by allowing less surplus material to machine, or, in some cases, to entirely eliminate the machine operation.

As a concrete example, piston castings produced commercially by the process, have been machined at a saving of more than 20 per cent over that required in machining exactly the same pistons cast in sand molds. A peculiarity of the casting made by the new process is that its physical properties are improved when annealed; a result exactly opposite from that obtained with sand cast iron. These castings may be made glass hard by immersing in cold water at a cherry heat; and again made soft and machineable by reheating and then cooling slowly. While in the hardened state the casting will take on and retain magnetism. In the soft state it will not. In many cases, the castings with surfaces that require great wearing ability, may be hardened by this method after machining. Castings of this type are free from the usual casting defects such as shrinks, blows, dirty spots, etc.; due to improved casting conditions and rapid solidification.

Application of the Process

The new process for casting materials of high melting temperature in permanent molds is a development in line with the natural industrial trend toward better and more economical mass production of standardized articles. As may be understood readily, the process is profitable or commercially suitable only where large quantities of standardized castings are required. Of course, there are certain special conditions which will make exceptions to this rule, but generally speaking, the use of the process would not be warranted where only a relatively small quantity of parts are required.

Casting Problems Are Individual

The question will be asked just what production requirement would permit the profitable use of the process. No definite quantity may be named that would take into consideration all casting fields and conditions. Each casting problem must be decided in accordance with its own peculiar set of conditions. In many instances it may be cheaper to make up an equipment for the permanent mold than to build a set of metal patterns; especially in a plant where an installation of the new process already is in operation.

In a certain foundry it was found more economical to build a mold for casting air compressor pistons than to build a metal pattern equipment. This was done in face of the fact that the production requirement of this particular piston is small; considerable less than 1000 pistons per order. This foundry operates a permanent mold installation and a complete order for pistons is run off at one time, and then the installation remains idle until the next order for pistons is received. The cost of this piston installation was little more than the cost of a piston metal pattern would have been. By using this process, the foundry finds it possible to save the use of a molding floor together with flasks, jolt machines, molder crew, etc. If a permanent mold installation already is in use a production of only 1000 castings of any one design would permit the profitable use of the process. The entire amount of castings could be run off in a few casting periods and the castings shipped out as required. In this way, even with small production requirements, it is possible to take advantage of the great saving in cost and improvement in casting quality inherent in this process. When casting in sand on a production basis, more or less costly foundry equipment is required. When the permanent mold process is used the sand and mold handling equipment is eliminated almost entirely and the metal handling and cleaning equipment is simplified greatly. The permanent mold installation cost is offset largely by the elimination of patterns and flasks.

Describes a British System of Finding Foundry Costs

By T. Smith

SEVERE competition of today has compelled many firms to take a much closer interest than formerly in the cost side of their business. Methods on similar lines to those outlined herein have been adopted with a view to ascertaining as nearly as possible the actual cost of each individual casting, and thereby doing away with the pernicious and dangerous system of averaging. It is freely admitted that cost is not and never can be the sole deciding factor in fixing selling prices, but at least it may point the way to an intelligent selling end and direct attention to those lines which are likely to prove of most advantage to the business concerned. The following methods are not hypothetical but are illustrative of practice in a large British iron and steel foundry.

In the iron foundry the costs were divided under four main headings, thus: (1) Cost of metal up to the stage of pouring. (2) Cost of direct wages spent on molding, coremaking and dressing. (3) Shop charges. (4) Administrative expenses.

Let us consider for a moment some of the factors that have an influence on the cost of metal. The grade of pig iron, the ratio of pig to scrap, the amount of metal used in gates, etc., all have to be taken into consideration. When it is realized that the price of pig iron, according to grade, may range from $1.50 to $1.00 per 100 pounds, and that the ratio of pig iron to scrap in the different castings varies from 80 per cent down to 25 per cent, it is obvious that there is quite an appreciable margin between which the ultimate cost of metal may vary. For example, consider locomotive cylinders made from the best grade of pig. The runners are higher in proportion to the finished weight than in the majority of castings. Since this excess metal eventually only has a scrap value it becomes a factor exerting a decided and upward effect on the metal cost. The accompanying Fig. 5 shows the variation in metal cost per 100 pounds for the same grade of castings according to whether the finished weight was 50, 60 or 75 per cent of the weight of metal poured. In each case, the cost of melting was taken at 30 cent per 100 pounds, a figure to which reference will be made at a later stage, the percentage of pig iron to scrap as 80 per cent and 20 per cent and the market price at $1.25 and $0.75 per 100 pounds. In the last column it may be noted there is a difference in metal cost alone of 55 cents per 100 pounds between the two extremes, a by no means negligible amount.

In the particular foundry under review the output was divided into four grades, A, B, C, D.; the main factors influencing the classification being: The ratio of metal required for headers, ratio of pig iron and scrap, grade of pig iron used.

For illustration consider two 100-pound castings: No. 1 made from pig at $1.25 per 100 pounds, with 80 per cent pig iron in its mixture and the casting weight equal to 50 per cent

Series 50. _____ WORK. 1275

JOB ORDER.

Dept. F

Order No. 32571 Machine No. _____

Name T Brown Card No. 1135

Operation Moulding

Article Frame Sides Patt'n A 437

30 Pieces ____ Rejects. Symbol 12 Drg. No. E 364

Piece Work Price $1.25 per Each. = $37.50

Tot. Time worked 58 Hrs. 0 Min. at 0.50 per Hour = 37.50

WORKMAN'S PROFIT = $10.00

Time on each 1 Hrs 50 Min. Cost each $1.25

Quantity Counted by H.M. Ch'k'd W.B. Storekeeper.

Completed to my satisfaction } A Jones Foreman.

Date of Completion 27.7.35

TIME ON JOB.

DATE.	ON.	OFF.	TIME.	Daily Quantities:
July 17	7 0	8 30	9 30	5
" 20	7 0	8 30	9 30	6
" 21	7 0	8 30	9 30	6
" 22	7 0	8 30	9 30	5
" 23	7 0	8 30	9 30	5
" 24	7 0	3 30	7 30	3

Total Time on Job

Piece Work Price Chk'd.

Time Extn. Chk'd. | Total Chk'd.

All Piece W. Calcn. Chk'd.

Time each and cost on Chk'd.

Posted to:—
C. Sheet
O. Sheet
P. W. Ind.
P. W. Ledger

Postings Chk'd.
C. Sheet
O. Sheet
P. W. Ledger

Passed for Filing.

S 9518.

FIG. 1—PIECE WORK TIME CARD

of the weight of metal poured. No. 2 made from pig at $1.00 per 100 pounds, with 25 per cent of pig iron in its mixture and the casting weight equal to 75 per cent of the weight of metal poured. In each case scrap rated at $0.75 per 100 pounds was used. The cost of metal, exclusive of melting loss, is shown in Fig. 2.

For a complete comparison, the cost of fuel for melting (necessarily higher for No. 1) would have to be added, but the foregoing sufficiently indicates the advantage of grading. These two cases are fairly representative of the highest and lowest grades of casting, A and D. The remainder fall between these two figures. The precise classification of any casting was fixed by the foundry superintendent, and as a guide in recording the output the number of each pattern was given a prefix A, B, C, or D. Thus it was possible to recognize at a glance the grade of any particular casting. This information also was supplied to the accountant for costing purposes. To arrive at the cost of molten metal use was made of a cupola charge sheet shown in Fig. 3, on which was entered a complete record of the metal put into the cupola and also of the fuel used for melting. It is important to note here that the weight of waster castings put back for remelting was not recorded since the weight previously had been included in their initial production.

To complete the first item, cost of melt, up to the stage of pouring, all expenditure must be included on wages for men engaged on charging and tapping the cupola, breaking up scrap, cost of repairs and relining the cupola, power for the blower, etc. Standard order numbers were allocated under which these disbursements were collected over a monthly period. The totals were transferred to a molten metal cost record, Fig. 4, and a cost thus obtained for metal for the four grades of casting. It will be evident that by this means all furnace losses, metal used for headers and in replacing wasters are covered automatically.

Although the figure of 30 cents per 100 pounds is only introduced in this article for the sake of illustration, this sum covers the expenditure on

	Weight of Metal Poured	Cost of Metal		Gross Cost	Credit for Residue	Net Cost of Metal
		Pig Iron	Scrap			
No.1	200	2.00	0.30	2.30	0.75	1.50
No.2	133	0.34	0.74	1.08	0.25	0.83

FIG. 2—COST OF METAL EXCLUSIVE OF MELTING LOSS

fuel and power and is a useful figure to take out from time to time to check any possible variations.

The Second Item

Little difficulty presents itself on the item of direct wages cost. Piecework prices are fixed by the superintendent for molding, coremaking and dressing and these entered on the men's time cards eventually are transferred direct to the cost record card of the particular casting to which they refer. A slight departure in this method applies to the process of dressing. An individual price was fixed for the larger and more intricate but the smaller castings were paid for on the basis of an all round price, in this case approximately 12 cents per 100 pounds.

In putting an order through the foundry copies are supplied simultaneously to the pattern shop and the foundry. The pattern is checked over or a new one made if required and then sent into a small sub-store attached to the foundry. At the same time a note is sent to the superintendent indicating that the order is ready. He in turn allocates the job to a particular workman and a time card, Fig. 1, then is made out, giving the price, etc., at which the work is to be carried out. It is apparent that methods of timekeeping applicable to other departments would be out of place in the foundry and accordingly the time spent, quantity made, etc., are all entered up by a clerk. The importance of booking the time on the various jobs will be appreciated as we consider the means adopted of debiting the indirect shop charges to the various orders. The greatest diversity exists in this section of cost practice. The cause of a good deal of the variation in the prices quoted by competing firms for any given contract rests on the different methods of debiting their indirect expenses. Under this heading come the expenses pertaining to lighting, heating, sand, repairs and depreciation of plant and buildings, supervisory and general staff. In effect all those expenses which definitely cease when the foundry is closed down.

The usual practice has been to include these expenses in the costs in one or other of two different ways: At so much per ton of output; or as a percentage on the direct wages. Both these methods are open to objection.

If the shop is engaged one week on heavy work and the succeeding week on light work, thus in all probability turning out twice as much tonnage in the first week as in the second, this method of distribution places twice as much charges on the heavy castings as it does on the light. Obviously at best this is a debatable method but sometimes used in foundries.

Usually quite a variety of wage rates prevail in the foundry and therefore debiting shop charges as a percentage of the direct wages means that work done by the more highly skilled men will bear a much higher proportion of the expenses than that done by the lesser skilled, such as youths and others.

To overcome these objections, the hourly rate method was adopted. The expenses under item 3, shop charges, are totaled each three months and divided by the gross number of hours worked by the men classified under the heading of direct wages. For example, the number of men on the pay roll amounted to 256 and the gross working hours in a quarter totaled 160,000. In the same period, the sum of $44,900 was expended in shop charges, equivalent to a fraction over 28 cents per hour. Thus according to the time spent on any given job, the shop charges were included at this rate per hour. Means were provided for balancing the gross amount included in the cost accounts against the sum actually expended under this heading, and any small adjustment found necessary was made by an alteration in the rate for the ensuing quarter.

Administrative expenses consisting of a due proportion of advertising, selling, insurance, general supervisory and other charges cover the fourth and last main cost division. Compared with the other sections this forms only a relatively small portion and may be covered by a percentage added to the totals of items 1, 2 and 3. In the particular works under review, this percentage for a normal period averaged only 7½ per cent.

Final collection of all the charges is made on a foundry cost record card, Fig. 6, in which is shown an example of the cost of a frame side for a heavy printing press.

While costs necessarily are higher in the steel foundry, practically the same procedure is adopted as outlined for iron castings. Costs of molt-

IRON FOUNDRY

Molten Metal Cost — Month ending.....

Grade	Output	Cost of Metal	Fuel	Power	Wages	Repairs	Gross Cost	Cost per 100 lbs.
A	51	3182	134	16	61	6	3399	330
B	32	1753	83	9	38	4	1887	294
C	105	4200	282	32	127	12	4653	221
D	115	3105	325	39	140	13	3622	157

FIG. 4—TOTAL COST RECORD FOR FOUR GRADES OF CASTINGS

Iron Foundry — Cupola Charge Sheet No. — Date

Grade	Pig Iron		Scrap	Alloys		Fuel		
	Brand	Weight	Weight	Name	Weight	Coal	Coke	Limestone
A								
B								
C								
D								

FIG. 3—CUPOLA CHARGE SHEET SHOWS WEIGHTS OF METALS AND FUEL

en metal will be increased by additional components such as ferromanganese, etc., and by the increased quantity of pig iron and scrap required to allow for the blowing off of impurities, while the expenditure on fuel inevitably will be on a much higher basis. Labor costs of dressing also are heavier since the removal of gates generally involves a sawing operation in addition to the mere chipping and filing required on iron castings. The cumulative effect of these extra charges is shown clearly in Fig. 7, where the gross cost of steel castings appears over a recent three-month period.

Installation of the foregoing methods has been of considerable benefit and undoubtedly has enabled the firm to submit quotations with a far greater degree of confidence than before.

A sound costing system has been described aptly as an excellent insurance policy and there is little doubt that its adoption, provided the danger of over-elaboration is eliminated, will hardly fail to be of service to many foundries in these days when the obtaining of remunerative orders is such a difficult matter.

IRON FOUNDRY COST RECORD

Part No. 826 Description Frame Side Drg. No. 1/205 Patt. No. A59

Order No.	Date	Quantity	Grade	Gross Weight	Molten Metal Cost	Direct Wages: Mold	Direct Wages: Cores	Direct Wages: Cleaning	Total Hours	Shop Charges	Administ. Expenses	Gross Cost	Cost Each
	7/25	6	A	9000	297.00	16.50	1.50	9.00	50	14.00	25.35	363.36	60.50

FIG. 6—CARD SHOWING COST OF INDIVIDUAL CASTING

Cost per 100 pounds of Metal per Casting Where the Finished Weight Equals 50-60 & 75 per cent of the Weight of Metal Poured.

% of Casting weight to metal poured	Weight of Metal Poured: Gross Pounds	Pig Iron Pounds	Scrap Pounds	Valve: Pig Iron	Valve: Scrap	Cost of Melting	Credit for Residue Less 5 % loss	Net Cost per 100 lbs.
50	200	160	40	200	0.30	0.60	0.67	2.23
60	166	133	33	1.66	025	0.50	0.47	1.94
75	133	107	26	133	0.19	0.40	0.24	1.68

FIG. 5—COST OF METAL BASED ON PROPORTION OF CASTING WEIGHT TO METAL POURED

Water Pipe Are Dipped in Coal Tar Pitch

Question: We are making some cast iron pipe fittings ranging in size from 4 to 12 inches diameter which required to be dipped in a protective tar coating. We have tried dipping them cold in a heated roofing tar but the mixture soon gets thick and chips off the castings. It is not satisfactory, also it is too expensive. Can you give us the formula employed in the regular pipe shops. Is the mixture heated and are the pipes dipped hot or cold.

Answer: Water pipe and fittings are heated to a temperature of 300 degrees Fahr and then dipped in a coal tar pitch bath maintained at the same temperature. They are allowed to remain in the bath for two minutes after which the surplus material is drained off and the castings are rolled away on skidways to dry. Standard specifications proposed by the American Society for Testing Materials and adopted by the various manufacturers follow: (a) When pipe or fittings are to be coated, coal tar pitch shall be used, which shall contain sufficient oil to make a smooth coating. The pitch shall be tough and tenacious when cold and not brittle nor having any tendency to scale. (b) The varnish shall be heated to about 300 degrees Fahr., and shall remain at this temperature during the time the casting is immersed. (c) Each casting shall be heated to a uniform temperature of about 300 degrees Fahr. immediately before it is dipped and shall possess this temperature at the time it is put in the bath. (d) Each casting shall remain in the bath at least two minutes. (e) Fresh pitch and oil shall be added when necessary to keep the mixture of the proper consistency and the bath shall be emptied of its contents and refilled with fresh pitch whenever the accumulation of sand or carbonaceous matter renders this desirable as can be seen by the solids adhering to the under side or lower ends of the castings. (f) After being coated the pipe and fittings shall be carefully drained of the surplus varnish.

Acquires Scale Company

Controlling interest in the Toledo Scale Co., Toledo, O., manufacturer of automatic scales, has been acquired by Hubert D. Bennett. Mr. Bennett has been elected president. O. C. Reeves, general factory superintendent since 1905, has been elected vice president, and W. C. Gookin, general sales manager, has been made second vice president.

The company was organized in 1901 by the late Henry Theobald to manufacture a computing scale operated by an automatic pendulum counterbalance. The product now is sold through ten branch offices in principal cities, numerous agencies and a sales force of about 400 men. The Canadian Toledo Scale Co., Ltd., operates a complete plant at Windsor and has a sales organization covering Canada.

STEEL FOUNDRY

3 Months Ending

Output	Weight of Metal Melted	Molten Metal Cost	Direct Wages: Molding	Direct Wages: Cores	Direct Wages: Cleaning	Shop Charges	Administrative Expenses	Gross Cost	Cost per 100 lbs.
320	548	265.00	103.75	10.18	12.87	123.25	30.05	545.10	85.50

FIG. 7—GROSS COST OF STEEL CASTINGS OVER A 3-MONTH PERIOD

Bill Wonders Why Barrels Are Scarce

BY PAT DWYER

AMONG the many toys, doodads, gadgets, hickeys, gifts useless and otherwise that floated down through the chimney and in through more plausible if less conventional entrances on Christmas eve, a box full of miniature structural steel parts that fell to the lot of one young hero, has retained its attractions longer than any other. Occasionally and as a special favor, the budding engineer allows me to stand by to hand him some of the various parts he requires in the erection of a sky scraper, a train shed or a gantry crane. He is graciously pleased to admit that sometimes I display almost human intelligence in picking out the pieces he requires, but as a general rule I am given to understand that my efforts are more of a liability than an asset. In fact he has claimed that the work goes along faster when he is alone or has the table to himself.

He has a dear little sister who many times has expressed a keen desire to be allowed to assist him, but for some reason he absolutely refuses to let her come near the table or that part of the floor where he is engaged for the time being converting a dream into a reality. He protests bitterly and in a loud voice that she does not know anything about machinery and that she will mix the parts in hopeless confusion if she is allowed to touch them. In an undertone meant solely for the young lady's ear he promises to smash every one of her fingers with a hammer if she dares to lay even one of them on any of his stuff. Sometimes in my position of unbiased observer I am inclined to rebuke this young savage for his apparent selfishness. I am reminded of the old rhyme about the little birds who agree so amicably in their little nest and I wonder why this young hammer wielder does not treat his dear little sister with a greater and more becoming measure of courtesy and kindness.

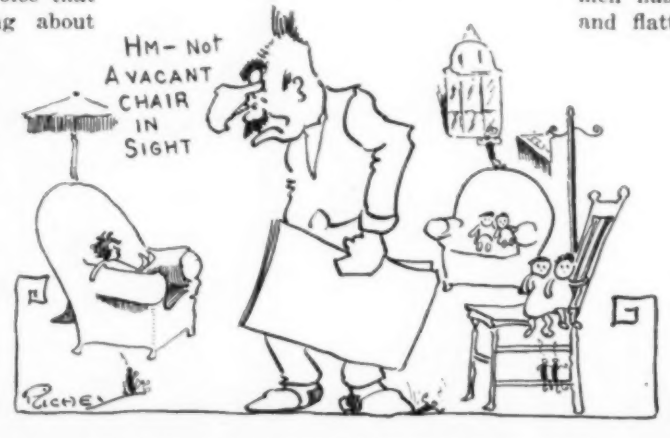
After the battlers had retired the other night I directed their lady mother's attention to the subject and asked her if she had any theory to account for it. She said she did not need any theory. The whole situation arose from the different dispositions of the two children. The boy is careful and conscientious, never breaks anything and puts everything away carefully when he is through playing. I was told quite plainly that the composite virtues of thriftiness, order and neatness were a natural heritage from his mother's side of the family tree. She did not like to say where that other young limb came by her wild ways and destructive nature, but the child only has two parents and so far as she was concerned I was perfectly welcome to draw any inference I pleased.

The boy has toys packed away in a drawer, toys he received several years ago and they are in as good condition now as they were on the night old Santa Claus dropped them down the chimney. The swashbuckling young heroine in a smock and bloomers has nothing.

Three days after Christmas her picture books look like something that had been dug out from under the snow at the fag end of a hard winter. Every one of her dolls has a leg or an arm or an eye missing. Some of them are minus both right and left members. The hair has disappeared from the head of a particularly big bulgy doll while the entire top of the skull has been smashed in on a doll with wobbly eyes.

I don't know if this doll's condition is due to a desire on the owner's part to see what made the eyes move, or merely to the fact that the doll served as a club, a weapon of offense and defense in certain slight bickerings that always seem to occur when the owner happens to be among those present. So far as I know the idea of substituting a doll for a flat iron in cracking walnuts is original with this practical minded young lady.

The only doll that has survived in half presentable condition up to the present is one made from particularly strong cloth and packed with sawdust. Even this tough little specimen has been distorted out of shape and flattened to an alarming extent. The nicely rounded, painted face originally wore what passes among us common people as an angelic expression. My own private opinion of that type of face is that the owner is a silly although probably harmless female nut. However, opinions differ and I am willing to concede my fellow citizens the right to admire as many of the movie queens as they please. What I was going to say was that the face



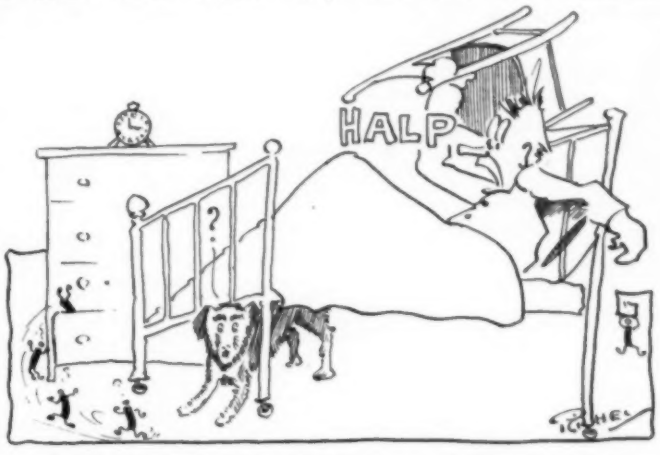
WHAT DO YOU SUPPOSE HAPPENED TO SALLY?

with the wide open eyes and cupid mouth now shows the effect of a hard and a fast life. Rough, that's the word. It looks as if the owner had gone three or four rounds with a steam hammer and then had been dragged out by the heels and thrown into the alley back of the vinegar works. These may seem hard words, mates, but I believe in sticking to the truth under any and all circumstances. Of course occasions arise when one may equivocate in pursuit of a worthy purpose, but this is not one of them and—Oh, well, let it go at that. One eye has been obliterated and that part of the face containing the other has been pushed so far to one side that the eye appears to be leering around a corner. The stuffing in the body and in the unwieldy limbs has been shifted in a manner to violate all the rules and laws of human anatomy. In the original state one would be toying perilously with the truth to claim that the thing was a miniature reproduction of the human figure. In it's present condition it resembles nothing so much as an old chew of tobacco magnified approximately 15 diameters.

I might tip Santa Claus off next Christmas to bring her a nice cast iron doll or one made of boiler plate stuffed with bird shot only I am afraid the dear little angel would instantly see the possibilities of crippling various members of the family by carefully dropping it accidentally on their toes. A doll is a doll and I really must draw the line when it is used as a substitute for a hammer or a projectile in smashing windows. A broken window may be tolerated in summer. It saves one the trouble of lifting the sash to admit the clear, pure air. This condition or necessity does not obtain in winter.

Sometime in the future when I have the necessary leisure I intend to look more deeply into the fundamental difference between summer and winter air. My interest purely is academic since I can live quite comfortably in a house if the windows never are opened. However, I know many worthy people who are convinced firmly that existence is not possible in summer unless the windows are opened. How they keep the flame of life burning in winter with the windows closed is somewhat of a mystery which, as I said, I shall try to solve at the first favorable opportunity.

What with one thing and another I have no idea when that opportunity will present itself. One job follows another with disconcerting regularity even if they do not follow in logical sequence. For example I had no intention of writing about dolls when I sat down to dash off this little scenario. They just seemed to ooze in after the fashion in which they creep under peoples' feet in every room in the house. For inanimate objects they have the most amazing faculty for traveling around and bobbing up in the most unexpected places.



WEATHER PROBABILITIES: TEMPERATURE DROPPING. STORMY

If I go to roost in an easy chair without first taking the precaution to examine it sharply I am as apt as not to find myself sitting on half a dozen assorted sizes of dolls in various stages of dissolution. The impresion momentarily is extremely embarassing. Usually it reminds me of an early experience when I inadvertently sat on a clutch of turkey eggs carelessly left by a caller on a low chair.

Certainly if there is one place more than another where a man should feel reasonably safe in moving around by day or night that place is his own bedroom. Even that sanctuary now is denied me. Until the other night I saw no occasion for switching on the light in my room while disrobing. The process is brief. I have no valet to attend me and naturally as a result of many years' experience I have developed a speed and technique, if I do say it myself, that is practically perfect. At a pinch I could go through the evolutions in pitch darkness, but as it is I am favored with a certain amount of light from a street lamp on the corner. Not enough of course to encourage reading after I retire, but sufficient to prevent me from barking my shins or stubbing my bare toes on the various articles of furniture that in some mysterious manner shift their positions in a perfectly dark room.

One night recently I was just going to fall into bed when my naked foot came down on a furry animal. My heart stopped temporarily at the expectation of feeling a set of sharp teeth clinch themselves in some part of my highly exposed person. For an instant I could not decide whether the better policy was to press down hard and trust to providence to squash the vital organs, or, to snatch my foot away and then look over the situation from the vantage point of the top side of the bed. I regret to say that the cowardly instinct prevailed and I jumped into bed. Even then I was terrified that the thing would jump in after me. Believe me I strained both eyes and ears for a few minutes. I heard no menacing growl to indicate the animal was preparing to spring, or even a feeble squeak to prove that it slowly was expiring from the effect of the pressure I had applied to its ribs. I peered over the edge of the bed in all directions, but failed to encounter a pair of gleaming eyes or a moving body of any kind among the shadows. Screwing what little courage I had left to the sticking point I jumped for the wall and snapped the light switch.

In the course of a long and fairly eventful life I have found myself on many occasions in a position where I willingly would have considered an offer of the traditional 30 cents for the entire works on the hoof. What I saw lying on the floor by the side of the bed in the full glow of the lamps made me think that a 25 per cent reduction in the usual price would find me in a receptive mood. The thing that almost caused a total nervous collapse was nothing more or less than one of these horrible little monstrosities known as teddy bears.

For the moment I was tempted to grab it by the hind legs and knock its saw dust brains out against the wall. Fortunately I restrained the impulse and thus probably saved myself from an extremely embarrassing explanation when the chatelaine of the old ancestral home should discover the remains scattered over the floor. I hate to make explanations of any kind so I compromised with my outraged feelings by tiptoeing into the next room and placing Teddy on the pillow beside the owner. When I peeped in again on the following morning the animal was hanging head down over the edge of the bed with one foot tightly clasped in a little chubby fist. The innocent faith of

children is marvelous. I had stepped on a horrible little beast in the dark and nearly had a fit. The young lady had slept with it all night, part of the time probably with one arm curled around it lovingly and never turned a hair. Faith or no faith I am going to bed no more in the dark.

Bill drifted in the other night to sit by the fire, smoke the pipe of peace and discuss the burning issues of the day. Among other items of more or less importance I touched briefly on the subject of dolls with particular reference to the one which almost caused me to pass out of the picture from heart failure.

He admitted that I had behaved with great fortitude during the trying ordeal and even with greater tolerance afterward. If he had been in my place he declared he would have made a clean sweep by gathering up every doll in the place and throwing them in the furnace.

He had an even more hair raising experience one night after he had retired. He was almost asleep when he felt the bed rising under him. With a wild yell he jumped from the bed and turned on the light. He grabbed a chair and stood on the defensive ready to sell his life if necessary as dearly as possible. He said I could imagine his chagrin when the family dog, a big hairy Airedale brute, crept from under the bed and stood blinking his wooly eyes at him and wagging his tail in the most friendly manner. The animal had sneaked under the bed to take a nap and then had elected the moment when Bill was going to sleep to rise and stretch himself preparatory to seeking his usual night couch elsewhere.

"I hit him a belt with the chair," said Bill, "where it would do the most good in helping him on his way, and believe me, young-feller-me-lad, he has done no more napping under my bed."

"Talking about dolls and dogs and one thing and another," said Bill, "I was in a foundry down east a few weeks ago where they make some of the most marvelous and artistic bronze castings my good fortune ever has privileged me to see. The molders there are rated as molders and paid the regular rates prevailing in the district, but I am afraid the company would have a fat job on its hands if the present crew disappeared and a new staff had to be recruited. Fortunately, nearly all the men have been continuously employed there for many years and since the surrounding conditions and working relations are congenial this contingency is extremely remote. Many of the men served their apprenticeship in the shop and the others learned the trade, if one may call their employment a trade, in the comparatively few similar establishments in this country.

"Large pieces of statuary, singly or in groups, memorial tablets, bronze caskets, and countless other objects designed either for ornament or utility are molded in sand. Many small objects also are made in sand molds, but a considerable quantity of miscellaneous small figures are cast in plaster molds.

"Gated metal patterns and some wood patterns are used for certain classes of work that do not differ materially from the run of work usually found in jobbing foundries. The molding practice also does not differ and the castings are poured in green sand. However, owing to the originality and the extreme intricacy of most of the work, the majority of the patterns are plaster casts made from the artist's original clay or wax model.

"These patterns are fragile and since the metal section of the casting is held to a thickness that will just permit the molten metal to run, the method of securing a cope and drag impression differs from that practiced in the ordinary foundry.

"For example, the plaster pattern for a tablet with many scrolls, flutes and artistic curves surrounding the inscription is built up solid on a board like one of these ceiling ornaments that once were fashionable for supporting chandeliers. The drag mold with all the necessary drawbacks for the undercut parts is rammed on this pattern and rolled over. The board and pattern then are removed and the cope rammed directly on the impression in the drag. In some instances sheets of oiled paper are spread over the impression, but usually the French sand of which the mold is composed is hard and firm enough to withstand the pressure with which the cope sand is forced against it.

"The cope is lifted off and rolled over on its back where the molder with suitable little sharp tools removes sufficient sand from the face to provide for the thickness of metal. In this manner the contour of the cope surface truly follows the contour of the drag face and insures a uniform thickness of metal all over the casting. The molds are dried.

"I should like to say a few words about the hollow figures and the methods pursued in making plaster molds, but life is short and time is fleeting. I may return to the subject some other time.

"However, you may be interested in a sidelight that was cast on the situation by an importer of French sand. I suppose you know that all sand is imported in barrels. This sand man claims he has difficulty in supplying his customers owing to the inability of the shippers to secure barrels. He did not commit himself to an explanation, but I gathered that the available supply of barrels is tied up in the transportation of a commodity that has been shipped in barrels since before sand was invented."

Within a radius of 100 miles of Pittsburgh nearly 20 per cent of the world's coal production is mined. Normally about 228,000,000 tons of coal are mined each year. This area supplies nearly 40 per cent of the coal mined in the United States.

NOW WHICH BRIGHT LITTLE BOY CAN TELL US WHAT ELSE IS SHIPPED IN BARRELS BESIDES BREAD AND BALONEY?

Control Tests Devised *for* Steel Foundry Sand

SAND for the steel foundry differs materially from that ordinarily found in other foundries, because the relatively high temperature required for pouring steel castings, necessitates refractory molds and cores. Generally, a sand containing from 94 to 99 per cent of silica, the most refractory material in natural sands, is used as a base for steel molding mixtures. Cohesiveness is imparted by adding bonding materials. The resulting mass requires moisture to give plasticity and a mixing procedure to provide for the distribution of all ingredients.

Good steel castings are, in large measure, the result of thoroughly satisfactory molding and core sand mixtures: and these may be expected to function properly only if blended so as to have uniform characteristics from day to day. Therefore, systematic means for determining the properties of prepared sands should be employed by steel foundries specializing in high-grade work, confidently expecting tomorrow to duplicate or improve the good work of today.

To serve such purposes the joint committee on molding sand research devised and standardized methods of tests, which now are in daily use at the foundries of the members of the Electric Steel Founders' Research group. Because of the destructive effects of high casting temperature on relatively poor sands, it is more important for those who cast steel than for those who cast other metals, to make routine sand tests to guard against any deterioration of a nature that may be completely obscured from casual observation.

Each group plant makes determinations for moisture in the prepared molding sand called *facing* which ultimately has direct contact with the molten metal. An excessive amount of moisture may generate enough gas during the pouring operation to cause blow holes or porosity. An insufficient degree of moisture prevents the sand mold from maintaining its desired firm condition, and causes crumbling, which mars the casting, and affords opportunity for washing loose sand into it. In all group plants, moisture tests of samples taken daily are made according to the standardized method, which requires drying for one hour at a temperature between 105 and 110 degrees.

An important property of molding sand is its cohesiveness. Special apparatus is required for this test, according to the standardized method. Some of this equipment is illustrated in Fig. 1. The sand is distributed uniformly, and mechanically rammed in a box from which the resulting specimen bar is removed without disturbance. The specimen bar is taken to auxiliary apparatus that propels it over the edge of a plate. As the bar advances at a uniform speed across the plate, the weight of the overhanging portion finally causes rupture. The cohesiveness of the sand is relatively indicated by the weights of broken portions of the specimen. Excellent means are thus provided for determining the strength of sand mixtures regularly prepared. Insufficient cohesiveness causes crumbling of the mold, as in the case of inadequate moisture. There may be a proper amount of water in the mixture without a sufficient amount of suitable bonding materials. Having made determinations for moisture and cohesiveness, the foundryman may determine what is lacking to give the sand sufficient firmness to resist the erosive action of the metal when it is poured.

Permeability or the property that permits gases to escape through the

THE consideration always devoted to molding and core sand has been stimulated greatly during the past few years by the activities of the joint committee on molding sand research. The investigation, undertaken by the American Foundrymen's association, has had the official co-operation of many national organizations and several government bureaus. The Electric Steel Founders' Research group has been represented on the joint committee, and has assisted in developing methods for controlling foundry sand mixtures. This article, which recently appeared in the publication of that organization describes briefly tests devised for molding and core sand in the steel foundry.

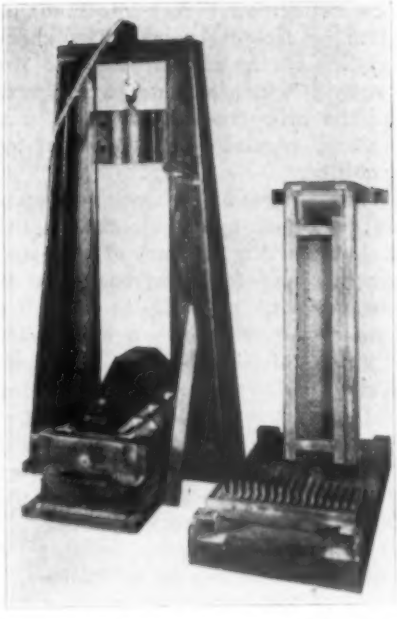


FIG. 1—PORTIONS OF COHESIVENESS TEST APPARATUS

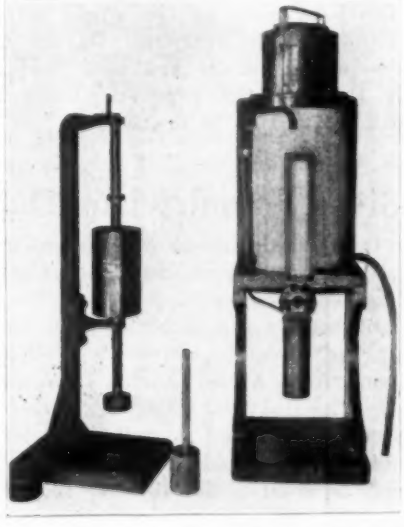


FIG. 2—DEVICE FOR DETERMINING PERMEABILITY

FIG. 3—TENSILE STRENGTH OF CORES IS DETERMINED ON THIS MACHINE

pores is another highly important condition of molding sand. The characteristics of the ingredients, the pressure with which all these are rammed, and the proportion of moisture in the mixture, regulate the degree of permeability.

The permeability testing apparatus developed by the joint committee is shown in Fig. 2. Part of this equipment is used for compressing a definite quantity of sand in a uniform manner through which a fixed volume of air is forced under stated pressure. A gage registers the resistance offered by the specimen to the passage of air. This provides a satisfactory method for determining relatively the degree of openness of the sand mixture when rammed under identical conditions, and thus to guard against using sand so close as to confine the gas generated in pouring. If this gas does not escape readily, it produces cavities in the castings. Other standardized testing methods employed by group plants include the use of the rotap machine with sieves for determining grain size, a factor of significance in providing smooth surfaces on castings. The daily use of this equipment is not as essential as are the others previously mentioned, provided the sand purchased does not vary in fineness appreciably. Testing equipment for molding mixtures may be applied readily to core mixtures. A supplementary test for these was developed by a group foundry, employing some of the apparatus designed for the cohesiveness test, and requiring other equipment, as shown in Fig. 3, to determine the tensile strengths of dried cores. "Green" cores are rammed in a box into which a definite quantity of sand has been introduced. Compression is regulated mechanically and uniformly by the ramming device for the cohesiveness test, as illustrated in Fig. 2. After the briquettes are thus formed, they are dried under predetermined conditions, following which they are broken by a machine employing the principle of those commonly used for testing cement. In this way the suitability and proper quantity of binders used in core sand mixtures are regulated, as is the baking operation, always a vital factor in developing the desired strength of a core.

As a means of usefully making local and group comparisons, values ascertained by regularly made sand tests are plotted, and charts showing the curves are distributed monthly by each group plant to all others of the group.

The routine methods that have been outlined briefly have been beneficial in maintaining uniformity in molding and core sand mixtures, without which there could not be expected from day to day that degree of similarity that should attend the manufacture of a first-class product. The nature of foundry work is such as to prevent that nearness to absolute uniformity of appearance which may be obtained in some manufacturing processes. The approach to this condition has been distinctly aided by routine tests that aid those producing steel castings, in maintaining stable conditions in sand mixtures. Step by step does the progressive foundryman eliminate or reduce to small proportions the variable factors prejudicial to the daily production of castings that are uniform in appearance and soundness.

Faked Foundry Facts

The Charging Floor

Sand Buckles Off Face of Wheel Mold

Question: On one of our castings, a heavy wheel with a face 12 inches wide, 5 inches thick at the center and 2½ inches thick at top and bottom of rim, the sand forming the face of the mold bulges into the iron while the mold is filling. The sand does not drop off, there is a thin film of iron behind it, but in cleaning the casting, the blister is knocked off and leaves a hollow spot on the face of the wheel. The casting weighs about 3 tons and the staggered arms are made in dry sand cores. The hub is split through the center horizontally with a thin core and this prevents us from pouring the wheel through the hub. We run it on the rim through five whirl gates made in cores. The defective area on the rim is in front of the gates, the remainder of the face is perfect. Facing sand for the rim is made up of local sand 2 parts, heavy pipe sand 2 parts, old heap sand 2 parts and sea coal in the proportion of 1 to 17. We shall appreciate any information on the cause and remedy for this trouble.

Answer: Sand will buckle off the face of a mold under one or all of four conditions: If it is rammed hard close to the pattern; if it is too fine for the class of work; if it is too wet; if it is not vented properly. The fact that your wheels only buckle near the runners inclines us to the opinion that perhaps the swab is used too freely in that vicinity; the hand rammer is employed in packing the sand between the runner cores and in all likelihood no provision is made for the escape of gas generated by the cores and steam from the sand. Your facing sand mixture apparently is satisfactory, otherwise the sand would buckle all over the face instead of only at one place.

You do not state whether the face of the mold is skin dried or not. If it is skin dried it is not necessary use any sea coal in the facing sand; but if the face is formed in green sand, the proportion of 1 part sea coal to 17 parts sand is of no benefit either in opening the sand or in peeling the casting. It is possible the 17 in your letter may be due to a stenographic error. Sea coal in the proportion of 1 and 8 should be used on the wheel in the vicinity of the runners. On the far side of the wheel and near the top of the rim the proportion may be reduced to 1 to 10 or 12.

Gives Foundry Iron Data

Data on the effect of charcoal iron on coke pig iron melted in the cupola, is given in engineering bulletin No. 1, published by the department of engineering research, University of Michigan, Ann Arbor, Mich. The tests were carried on under regular production conditions at one of the large automotive foundries. The bulletin may be obtained for 50 cents from the director, department of engineering research, Ann Arbor, Mich.

Revise Scrap Specifications

Buyers and Sellers Make Important Changes in Standards for No. 1 Heavy Melting Steel as Well as Other Classes

By Fred B. Pletcher
Washington Correspondent, THE FOUNDRY

A CONFERENCE of buyers and sellers of scrap held in the department of commerce building, Washington, Feb. 4 approved revisions of more than 100 items in the classifications for the purpose of clarifying the standard classifications of iron and steel scrap adopted about a year ago at the bureau of standards. These changes have been before the metallurgical industry for a year.

The conferees were guided in the revisions by several hundred mail suggestions submitted to the iron and steel committee of the National Association of Purchasing Agents and others actively interested in the plans. Preceding the revision conference, an informal meeting was held in the Raleigh hotel on Wednesday night, Feb. 3, to consider the suggestions sent in from a number of sources.

The most important changes adopted were those for No. 1 heavy melting steel, in which it was attempted to clarify specifications concerning which some question had arisen. The revised specifications for heavy melting steel are shown in the accompanying table. It was voted that the revised specifications become effective July 1, or sooner if individual sellers, buyers and users are ready to do so.

Some discussion developed concerning the problem of classifying chrome and other alloy turnings, particularly those coming from automobile plants. Scrap of this nature often is mixed with carbon scrap, without the knowledge of the shipper, who receives it just as it is collected at the plant. Rejections result, which are costly to the scrap seller. H. R. De Groat, Allwood & Co., Philadelphia, pointed out that this situation may have a serious result on the scrap markets in the future, and that it has become a problem of importance to inform the dealer and shipper of scrap and the foundry and other users that large quantities of chrome and other alloy scrap are being collected and shipped with carbon grades, particularly from such centers as Detroit.

The conference was attended by representatives of the American Foundrymen's association, the American Electric Railway association, the American Society of Mechanical Engineers, the American Engineering council American Railway association, the National Association of Sheet and Tin Plate Manufacturers, and representatives of metal-working industries and waste material dealers. Changes were adopted for scrap for brass furnaces, basic open hearth furnaces, acid open hearth, electric furnaces and gray iron foundries. Specifications also were approved for scrap for rolling mills, but it was decided to invite criticisms on the latter before definitely adopting the program. W. Chattin Wetherill, director of the metals ultilization committee of the department of commerce, who presided at the meeting offered co-operation of his committee and the division of simplified practice of the government in circularizing buyers, sellers and users of this grade of scrap.

The conference also adopted tentatively a standard scrap purchase contract form, which had been prepared by the purchasing agents' association and the National Association of Waste Material Dealers. This contract form complies in general with the standard form adopted by the purchasing agents' association through the co-operation of the division of simplified practice last summer.

The work of obtaining uniform specifications has been under way since 1923, when several sets of specifications were in use. H. C. Wickline, of the Union Steel Casting Co., Pittsburgh, also representing the National Association of Purchasing Agents, presented the report for revision.

Remove Brittleness in Malleable Iron

Malleable iron when subjected to the hot dip galvanizing process sometimes becomes brittle. To remove the tendency toward this defect, the Ohio Brass Co., Mansfield, O., has developed a method of heat treating malleable castings. It is claimed that this process prevents brittleness and makes the castings easier to machine. The process of heat treating, according to the manufacturers, does not interfere in any way with the malleable characteristics of the metal. The company also states that the process improves the properties of the metal and that this process has been used by this firm on all its malleable castings for the past two years with beneficial results.

Eighty-six per cent of the beehive coke of the country was produced in the Pittsburgh area in 1923. The value of the coke was $100,000,000.

Specifications Adopted for Heavy Melting Steel

Steel scrap ¼-inch and over in thickness, not over 18 inches in width and not over 5 feet long. Individual pieces must be cut into such shape that they will be free from attachments and will lie flat in a charging box. Plate scrap must be approximately 15 x 15 inches. Cut boiler plate must be cleaned of lime and free from staybolts and not over 3 feet long. Smaller dimensions of plate and scrap may be required on special agreement between buyer and seller. No piece to weigh less than 10 pounds.

May include structural shapes, bars and plates, steel castings, heavy chain, carbon tool steel, heavy forgings, forge butts and similar heavy material.

This grade may also include new mashed pipe ends, original diameter 4 inches and over, thoroughly flattened, sheet bars, billets, blooms, rail ends, railroad steel scrap such as angles, splices, couplers, knuckles, short rails, draw bars, cut cast steel bolsters, coil and leaf springs (all coil springs to be ⅝-inch or larger diameter.)

No needle or skeleton plate scrap, agricultural shapes, annealing pots, boiler tubes, grate bars, cast iron, malleable iron, or curly or unwieldy pieces will be accepted.

Must be free from dirt, excessive rust or scale or foreign material of any kind. Alloy steel scrap may be excluded from these specifications by mutual agreement between buyer and seller.

American Railway association specifications Nos. 7, 8, 9, 21, 24, 31, 36 and 44 will be accepted.

Sharpen Tools on Stones

Patternmaker Uses Natural and Artificial Abrasives To Produce a Cutting Edge

By Walter C. Ewalt

NATURE has provided a means of sharpening tools by producing in its laboratory various stones for the purpose. Natural stones are those quarried from beds of stone, being blasted or drilled out of the solid rock and shaped to the required sizes by sawing, chipping, etc. Artificial stones either are made up of small grains of natural abrasives, held together with various cements or are produced in the electric furnaces.

When a tool is dull or worn down to a blunt edge it is ground on a coarse wheel which generally is of an open grit. This type of wheel gives rapid grinding which, at this stage of sharpening, is desirable, but it leaves the tool with too coarse an edge for wood working. The oil stone is used after grinding to give a finer edge.

A fine even grain is desirable in a natural stone, with any seam of hard quartz absent. In this country there are two well known kinds of natural oil stones. These are called the Arkansas and Washita and are quarried in the Ozark mountains in Arkansas. The Arkansas is composed of practically pure silica and is the hardest of the two, coming in two grades, namely hard and soft. In the finest and hardest stones, the grains or crystals are small and sharp pointed, and being exceptionally hard, are used to cut and sharpen steel tools. Of course, these fine hard grains give the finest and smoothest edge to the tools, but it also takes longer to sharpen them and therefore the hard Arkansas stones are seldom used by pattern makers.

The soft Arkansas stone is considered by many to be the best natural stone for sharpening wood working tools. The grains being coarser and softer naturally cut faster than is the case with the hard stone and a fine edge is imparted to the tool, especially if stropped on a piece of leather. The correct way of sharpening was explained in the article on the chisel.

The Washita stone is composed of almost pure silica and is more open and porous than the Arkansas stone. It comes in various grades, from perfectly crystallized and porous grit to vitreous flint and hard sand stone. The sharpness of the grit depends on the crystallization, the best stones being exceedingly porous crystals. Some workmen like these stones the best. Strange as it may seem, about 99 per cent of workmen think the stone they own is the best one in the world.

Small pieces of oil stones, called slips, also are made in many different forms. These are used on gouges and on other tools which are held stationary and the tools are sharpened by moving the stone back and forth.

Other stones used for sharpening tools are emery and corundum stones, these being natural abrasives. Emery contains some elements which are non-abrasive while corundum is better as it contains more crystalline alumina which is the cutting element in both.

Special Stone Is Used

A stone is on the market which is made up of Turkish emery, one side of the stone being composed of fine grains and the other side of medium size. The stone is placed in a wood box to protect it from injury and to keep it clean. A reservoir is located at the bottom of the box made of sheet steel and holding the oil. The stone is held above the bottom of the reservoir about ¼-inch and the space is filled with oil soaked waste. By capillary attraction the oil is fed to the top of the stone, making it ready for use. The theory is presented that by the oil working upwards, the small particles of steel which are whetted off of the tool wili be prevented from working their way into the stone, but will work over the edge of the surface. Kerosene or thin oil is used.

Other artificial abrasives are made in the electric furnace. These consist of two kinds, namely aluminium oxide and silicon-carbide. Aluminum oxide is light brown or yellow in color and is made of a mineral called bauxite, this type of a stone is used in sharpening tool steel. The silicon-carbide is made up of coke and sand, is dark in color and is used to grind cast iron. The stones are graded from soft to extremely hard. The grain also is graded according to the number of meshes to the inch through which it will pass.

Whetstones should be handled carefully and nothing but good machine oil or kerosene used on them. After using, they should be wiped clean and then given a coat of clean oil. This keeps the stone soft, for if left dry, the stone hardens. A cover also should be used. If oil is not used to carry away the particles of steel, the stone becomes glazed and useless.

When sharpening a chisel or plane bit, the full length of the stone should be used. The natural tendency is to use only the middle, so in sharpening pocket knives, etc. the ends should be used to help even up the stone. If the stone becomes uneven, rubbing it on sand paper or on a disk grinder which is about worn out, will restore it to a flat surface. Some use sand and water placed on a straight iron plate for this purpose.

After whetting of the tool, the wire edge is taken off by lapping the tool on the palm of the hand or a piece of leather fastened on the cover of the box which contains the stone. Others fasten one end of a barber's strop to the bench and strop the edge similar to a barber stropping a razor.

A buffing wheel also may be used to remove the wire edges left on the tools after whetting. The buffing wheel is made of disks of cloth which are clamped together and placed on a mandrel and run in a lathe. However, care must be used or the back side of the chisels or plane bits will be rounded over. The buffing wheel has another important function in the pattern shop, namely that of polishing tools, such as scales or rules, etc. Buffing soap, which is a combination of various substances such as crocus, bees-wax, vienna lime, rouge, etc. may be bought and assists in the polishing. A buffing wheel from 4 to 8 inches in diameter should run about 7000 feet per minute.

Along with the oil stones, the worker needs an oil can of about one pint capacity. For the sake of cleanliness, this should be cleaned daily with some waste.

An assortment of files is necessary to sharpen various tools, such as saws, bit, etc. Beside the three cornered files used for the above tools, several small sizes of flat and half round files will be necessary for filing various other things and should be part of the kit of patternmaker's tools.

Sharpshooters Profit from Sellers' COST IGNORANCE

P. T. Barnum Says/

THIS false economy may frequently be seen in men of business and in those instances it often runs to writing paper.

BARNUM was right. Don't understand from this that I am again crediting him with a caustic bit of wisdom about the rapid birth rate of fools, but notice the observation from his pen which appears directly to the right. Economy, thrift, care in expenditure or whatever term you may use to designate the trait are different entirely from penuriousness or meanness. The latter always makes some other fellow the goat. Meanness brings distrust. Such was the case of the farmer about whom the nigger remarked, "He am so mean en he frows out such a sho't ration o' cawn 'at when he calls em, 'sookie pig' dem hawgs jes natchelly runs de tother way, an Ah don' mean puhaps."

—: :—

MUCH has been said about the thrift of the Scotch people. Yet with all the more or less wise cracks and pointed stories about the Scot, a sound undercurrent of respect is present for the saving habits of that race. It has remained for the horse trader, the shoddy merchant and the seller of "repossessed" cars who crams the differential with grease and sawdust to inherit the title of mean. A mean man always profits by the loss of others.

—: :—

THE constant cry in automobile production has been for economy. Competition has forced the most stringent supervision to bring about all possible savings in manufacture. This has given America the low priced car. It has given the buyer the greatest value for his money that ever has been known. Recently a new tendency has been noted that smacks more of meanness than economy. Prices of passenger cars have been reduced to extremely low levels, and a number of manufacturers who buy parts from independent producers have attempted to pass along to the latter a large measure of the reduction in the final or sales price of the car. One firm in buying malleable castings, it is said, continually demanded lower quotations from the foundry. When the manufacturer stood firm, the foundryman surrendered the business stating that he would not jeopardize his reputation by furnishing the low quality castings which it would be necessary for him to make on the order as it was priced. Another automobile firm is said to have instituted a rule that at the close of each day each assistant purchasing agent should report the actual savings he had made for his company through reductions in materials purchased.

—: :—

THESE attempts to beat down the selling price can have only one meaning. The seller is lost unless he knows positively and beyond argument what it costs him to produce what he has to sell. To the foundryman who sells any kind of castings to automobile plants the warning is particularly pertinent, but it applies almost in equal degree to every other foundry line. Costs give a basis for arriving at a correct selling price. Further, when correctly distributed they enable a foundry owner to locate and reduce production expenses which are too high. And finally they furnish an argument which even the keenest buyer cannot overcome.

Phineas, Jr

The Shakeout

DAN M. AVEY, Editor
PAT DWYER, Engineering Editor
CHARLES VICKERS, Nonferrous Editor
FRANK G. STEINEBACH, Associate Editor

¶ Proposed Sand Survey

FOR the past few years the subject of sand control, conservation and reclamation has attracted more attention than any other subject presented before the annual conventions of the American Foundrymens association. Progress reports submitted from time to time by various committees serve to indicate the almost endless mass of detail which has to be tried out, checked and rechecked under varying conditions before workable conclusions can be adopted and recommended for general use. In the meantime many individual firms have worked out systems of their own and placed them in successful operation. Realizing the vital importance of the subject THE FOUNDRY has made a survey of the situation partly by a selective questionnaire sent to representative plants and partly by personal visits to a number of outstanding establishments with a view of presenting a cross section of the views held by foundrymen on the relative merits of new sand and other materials as rejuvenating mediums in the molding sand.

DISSEMINATION of knowledge usually makes slow progress particularly where it may be in opposition to long established custom. This is especially true in the foundry industry where the number of men who attend the technical sessions at the conventions is almost negligible in proportion to the total number of men engaged in the production of castings. From its prominent position in the casting field where it is read by practically every operating executive THE FOUNDRY is in a position to make knowledge universal. To acquaint every one with the results of work carried on by the pioneers, the men who constantly are on the alert to increase production and cut down operating cost. Progress in any line is possible only through exchange of information and THE FOUNDRY believes that the proposed series of articles which starts March 1, will be of direct benefit not only to those who formerly have not given the subject any consideration, but also to those who have carried on research work to a greater or less degree.

¶ Poor Guessers Predominate

AID of the departmentof commerce has been solicited by the Steel Foundry Society of America and the American Malleable Castings association in the movement to secure the showing of weights of castings on the blueprints sent to the foundry. The weight of the casting often is an important factor influencing the bid for foundry work, and all bidders will work on a more equal basis if the weight figured by the designer or engineer is placed on the blueprint.

Individuals and other organizations have seen the value to be derived from the advocated practice, and have been working to accomplish this result. The cost committee of the American Foundrymen's association has referred its endorsement of the adoption of the practice to the board of directors of this organization, fully realizing the necessity of such a movement after the announcement of the results of an estimating contest held at Syracuse last fall. The weight of a 109-pound casting was estimated by 997 persons, the average estimated weight being 178 pounds, 12 per cent of the guesses being below the actual weight and 88 per cent being above the actual weight, while only three men came within ½ pound of the correct weight. If the persons taking part in this contest may be considered as average foundrymen, the contest plainly shows that all do not secure results within reasonable limits when estimating the weight of castings.

THE FOUNDRY believes that the department of commerce is serving the industry by taking up this question with the view of having the practice adopted in this country, and that all groups and individuals should co-operate in this movement to reduce waste.

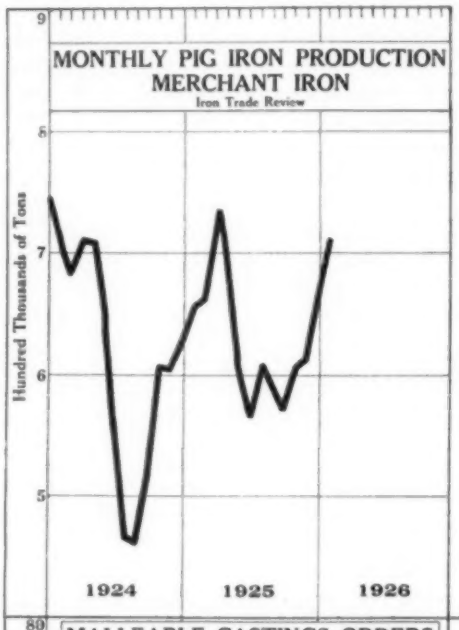
The original suggestion for the placing of the weight of the casting on the blueprint, made by Thomas E. Durban, Erie Forge Co., Erie, Pa., was reported in THE FOUNDRY in the issue of Sept. 1, 1924, page 701, and the movement was given the endorsement of this publication in the Nov. 1, 1924, issue.

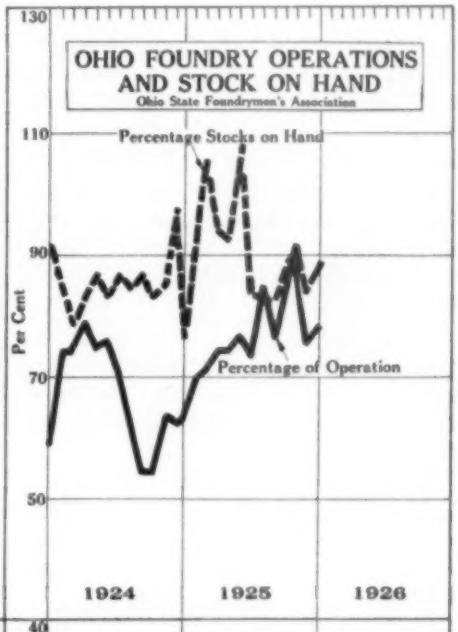
Trade Trends in Tabloid

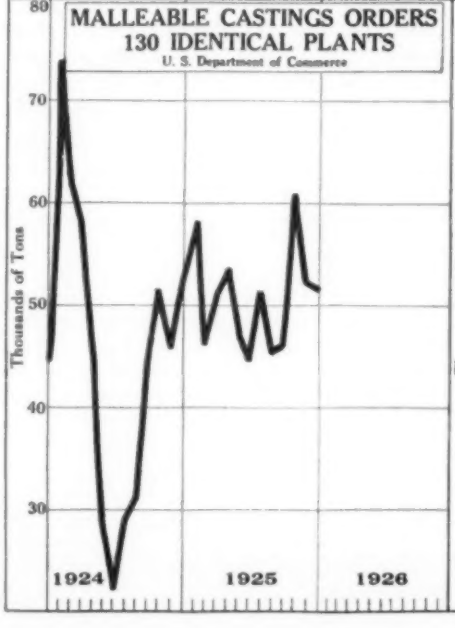
WITH a slight pickup over the total noted for December, January production of pig iron, according to statistics compiled by *Iron Trade Review*, was the second highest in history for that month. The total of all classes of pig iron, made in January was 3,322,672 tons, a gain of more than 73,000 tons over the preceding month. Merchant iron output was 709,642 tons compared with 664,681 tons for December. On a daily average basis, the rate for January was 22,892 tons per day compared with 21,441 tons per day in December, marking an advance of 6.7 per cent in the output of the class of pig iron in which foundries primarily are interested. General foundry conditions are good. Slight recessions have been noted in the demand for automotive castings, but this condition is regarded as temporary. Building construction shows no sign of decreasing, December awards having run 60 per cent ahead of the same month in 1924. Average New York prices for nonferrous metals in January, according to the *Daily Metal Trade* follow: Casting copper, 13.376c; electrolytic copper, 14.065c; Straits tin, 62.331c; lead, 9.358c; antimony, 23.287c; aluminum, 98-99 per cent, 27.00c. Zinc was 8.468c, E. St. Louis, Ill. Nonferrous foundries making specialties are active and a fair volume of business in plumbing goods is reported, in keeping with the building construction rate.

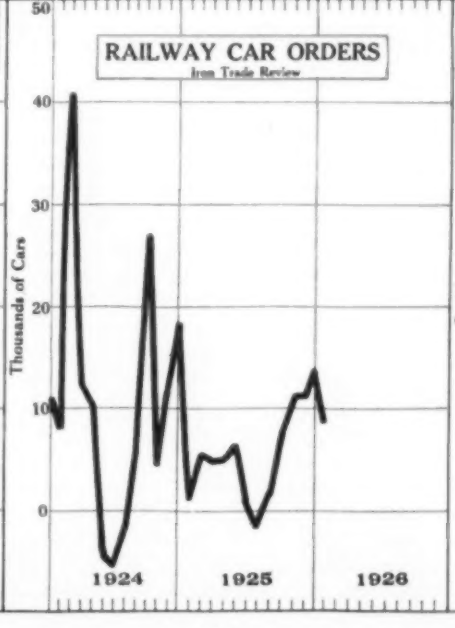
RAW MATERIAL PRICES
FEBRUARY 6, 1926

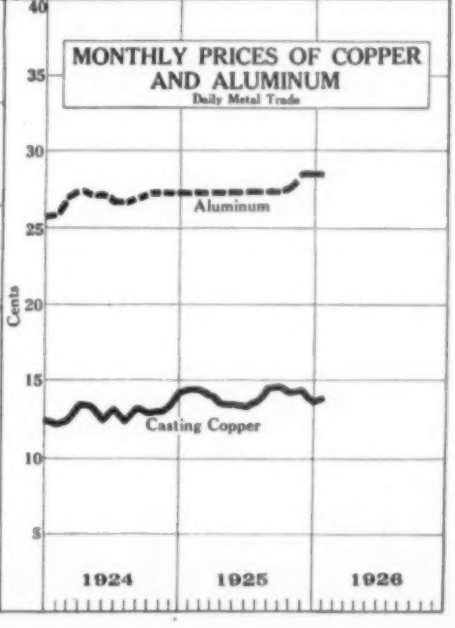
Iron	
No. 2 foundry, Valley	$20.50
No. 2 Southern Birmingham	23.00
No. 2 foundry, Chicago	23.00
No. 2 foundry, Philadelphia	23.39 to 23.76
No. 2 foundry, Buffalo	21.00 to 22.00
Basic, Valley	20.00
Basic, Buffalo	20.00 to 20.50
Malleable, Chicago	23.00
Malleable, Buffalo	21.00 to 22.00
Coke	
Connellsville foundry, coke	$7.50 to 12.50
Wise County foundry, coke	6.50 to 7.00
Scrap	
Heavy melting steel, Valley	$18.00 to 18.50
Heavy melting steel, Pitts	17.50 to 18.00
Heavy melting steel, Chicago	13.75 to 14.25
Stove plate, Chicago	16.50 to 17.00
No. 1 cast, mach., New York	15.00 to 15.50
No. 1 cast, Chicago	18.75 to 19.25
No. 1 cast, Philadelphia	18.00 to 18.50
No. 1 cast, Pittsburgh	17.00 to 17.50
No. 1 cast, Birmingham	17.00 to 17.50
No. 1 cast, Buffalo	16.50 to 17.00
Car wheels, iron, Pittsburgh	18.00 to 18.50
Car wheels, iron, Chicago	17.00 to 17.50
Railroad malleable, Chicago	17.75 to 18.25
Agricultural, mall., Chicago	16.50 to 17.00
Malleable, Buffalo	19.50 to 20.00
Railroad malleable, Pitts	18.50 to 19.00
Nonferrous Metals	Cents per pound
Casting copper, refinery	13.75 to 13.80
Electro copper, producers	14.25 to 14.37½
Straits Tin	63.25
Lead, New York	9.25
Antimony, New York	21.75
Nickel, electro	39.00
Aluminum, No. 12, prod'rs	26.50
Aluminum, No. 12, remelt	24.00 to 25.00
Zinc, E. St. Louis, Ill	8.05 to 8.10











Comings and Goings of Foundrymen

JAMES ASTON, metallurgical engineer in charge of research with the A. M. Byers Co., Pittsburgh, has been appointed professor of mining and metallurgy and head of the department of mining and metallurgical engineering of the Carnegie Institute of Technology. The appointment fills the vacancy caused by the death of Prof. Fred Crabtree last February. Prof. F. F. McIntosh, who has been in charge of the department as acting head has resigned to accept a position with the Crucible Steel Co.

G. A. Doeright was re-elected president of the Falcon Bronze Co., Youngstown, O., at its annual meeting held Jan. 16.

F. McCarthy for the past 10 years in charge of the Henry Furnace & Foundry Co., Chagrin Falls, O., has resigned to become a representative for Hill & Griffith Co., Cincinnati

Arthur Johnson has been promoted from secretary and general manager to secretary and treasurer and general manager of Belding Foundry Co., Belding, Mich.

H. M. Riddle Jr., treasurer of the Asbury Graphite Co., Asbury, N. J., addressed the Philadelphia Foundrymen's association, Feb. 10 on graphite and plumbago.

W. G. Adams, formerly brass foreman with the Wolff Mfg. Corp., Chicago, has accepted a position with the Republic Brass & Mfg. Co., Los Angeles.

Freeman W. Stowe, formerly sales engineer with the Sivyer Steel Casting Co., Milwaukee, has become associated in the same capacity, with the Deemer Steel Casting Co., New Castle, Del.

George S. Evans, metallurgist, the Mathieson Alkali Works, Chicago, discussed the use of alkalies in cupola practice before a meeting of the Detroit Foundrymen's association, held at the Union League club, Jan. 21.

E. T. Freeman, for several years superintendent of the Wisconsin Gray Iron Foundry Co., Milwaukee, has resigned his position, due to poor health, and expects to spend the next year traveling.

A. J. Snyder, at one time connected with the Unique Brass Foundry, Inc., Buffalo, and later with the Metal & Alloys Specialities Co., Buffalo, Now is foundry superintendent with the Ritter Dental Mfg. Co., Rochester, N. Y.

R. R. Clarke, brass foundry superintendent of the General Electric Co., Erie, Pa., addressed the members of the New England Foundrymen's association Feb. 10 on the subject of "Simple Laws and Their Simple Application in the Foundry."

Open New Offices

The Erie Foundry Co., Erie, Pa., has established offices at 1120 Myrtle avenue, Plainville, N. J., in charge of Howard Terhune; 549 Washington boulevard, Chicago, in charge of L. F. Carlton; and at 409 Donovan building, Woodward avenue, Detroit, in charge of R. B. McDonald.

British Foundryman Ill

J. E. Fletcher, who presented the annual exchange paper at the Syracuse convention of the American Foundrymen's association and is well known in England as a foundry expert, holding the position of consultant to the British Cast Iron Research association, was taken ill a short time ago and has undergone an operation at the Bushwood Nursing home, Birmingham, England. The operation has been successful and Mr. Fletcher is making satisfactory progress toward recovery, although he probably will not leave the institution for some time.

Ceramic Society Meets

The twenty-eighth annual meeting of the American Ceramic society was held at Atlanta and Macon, Ga., Feb. 8-13, the subjects of art, enamels, glass, heavy clay products, refractories, terra cotta and white wares being discussed. Among the papers presented at the refractory division are included the following: "Specifications for Buying Refractories" by M. C. Booze, Refractories institute, Pittsburgh; "Service Requirements for Plastic Refractories," by Hugh E. Weightman, Ferguson, Mo.; "Effect of Furnace Atmosphere on the Deformation under Loads of Fire Brick of Varying Iron Content," by L. F. Sheerar, bureau of mines, Columbus, O.; "Mineralogy of Clays" by J. Spotts McDowell, Harbison-Walker Refractories Co., Pittsburgh; "Note on Refractory Clays" by D. W. Ross, Findlay Clay Pot Co., Washington, Pa.

A number of industries in the vicinity of Atlanta and Macon were inspected during the convention by the various divisions of the society. The delegates also visited Stone mountain and various points in Wilkinson county.

Will Consider Adding Weights to Drawings

A conference of various trade associations, manufacturers and users of castings has been called by the department of commerce to consider adopting the practice of showing weights of castings on blueprints sent to foundries for estimate. This conference will be held in room 703, commerce building, Nineteenth and Pennsylvania avenue, N. W., Washington, at 10 a. m. Thursday, Feb. 25, according to a notice sent out by W. Chattin Wetherill, director of the metals utilization committee of the department of commerce.

Equipment Manufacturers Elect Officers

The annual meeting of the Foundry Equipment Manufacturers' association was held Feb. 2 at the Hotel Cleveland, Cleveland. Election of officers took place, the following being chosen for the year 1926: President, S. T. Johnston, S. Obermayer Co., Chicago; vice president, T. W. Pangborn, Pangborn Corp., Hagerstown, Md.; secretary-treasurer, H. Cole Estep, Penton Publishing Co., Cleveland. T. W. Pangborn was re-elected a director of the association for a 3-year term. The next meeting of the society will be held at French Lick Springs, Ind., April 22-23.

Greater Pittsburgh, comprising the area within 30 miles, produces 8,500,000 tons of pig iron a year, equal to more than 20 per cent of the country's total.

The Harnischfeger Sales Corp., Milwaukee, has opened a branch office at 808 Guaranty building, Indianapolis. James H. Enochs is district manager in charge.

Push Furnace Project

Support in the project to make Philadelphia a pig iron producing center has been asked of the United Gas Improvement Co., that city, in a formal communication from the Philadelphia Foundrymen's association. The foundrymen have presented two alternate propositions to the gas company. The one preferred by the foundrymen is that the gas company install by-product coke ovens so that hard coke will be made available for supporting one or more blast furnaces. The other proposition is that the proposed blast furnace plant manufacture its own coke and furnish the resulting gas to the United Gas Improvement Co. The letter points out that about half a million tons of foreign pig iron came into the United States in 1925, and that instead iron ore could be imported for the proposed furnace plant at Philadelphia. The letter prophesies that the establishment of pig iron production at Philadelphia would save the foundries there at least $2 a ton on their iron.

Sells Foundry Department

Superior Foundry Co., Cleveland, has sold its piano plate department, one of the smaller portions of the business, and will use the space and facilities to develop and increase further its jobbing business in gray iron and semisteel. The piano plate business has been taken over by the Wickham Piano Plate Co., Springfield, O., and the Paragon Foundries Co., Oregon, Ill.

Plans Entertainment

The February meeting of the Detroit Foundrymen's association, to be held Feb. 25 at the Union League club, 35 West Grand River avenue, will be devoted to the organization of committees and the making of arrangements for the convention and exhibition of the American Foundrymen's association, to be held in Detroit Sept. 27 to Oct. 1.

John S. Sammons, formerly of Albert Pick & Co., Chicago, has been made sales manager of the Beardsley & Piper Co., Chicago.

Obituary

William P. Champney, president of Eberhard Mfg. Co., Cleveland until his retirement last September, died Jan. 24 in Sea Breeze, Fla., at the age of 74. Mr. Champney has been connected with the Eberhard company since its incorporation in 1881, serving first as secretary and treasurer. Prior to that time he was with the National Malleable Iron Co. On the death of the first president of the Eberhard company, A. A. Pope, in 1913, Mr. Champney became president. He was also a director of the National City bank, Cleveland.

Luther Hess, owner of the Hulley Foundry & Machine works, Marion, Ind., died recently at his home in that city, aged 61 years.

Charles Albert DuCharme, until recently president of the Michigan Stove Co., Detroit died at his home there Dec. 28 at the age of 67 years. Mr. DuCharme was born in Detroit and started as a clerk with the Michigan Stove Co. in 1879, and his interests remained with this company, of which he eventually became head. At the time of his death, Mr. DuCharme was a director of the new Detroit-Michigan Stove Co., which resulted recently from the merger of the Michigan Stove Co. and the Detroit Stove Co. He was also a director of the Ireland & Matthews Mfg. Co., People's State bank, Union Trust Co. and the Detroit Fire & Marine Insurance Co., all of Detroit.

Foundry Association Directory

Twin City Foundrymen's Association
Minneapolis-St. Paul

S. V. WOOD, president, Thirty-eighth avenue and Fifth street, Minneapolis; C. LANGDON, secretary. Meetings monthly at the Athletic club.

Tri-City Technical Council
Moline, Ill.

H. BORNSTEIN, chairman, Deere & Co., Moline, Ill.; HOWARD ROGERS, vice chairman, Williams, White & Co., Moline, Ill.; MAX SKLOVSKY, treasurer, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Newark Foundrymen's Association
Newark, N. J.

J. L. CARTER, president, Barlow Foundry, Inc., Newark; WILLIAM GOLDSMITH, vice president, C. A. Goldsmith Co., Newark; J. A. WILLIAMSON, treasurer, Isbell-Porter Co., Newark; W. H. MANTZ, secretary, Atlas Foundry Co., Irvington, N. J. Meetings called by president.

Southern Metal Trades Association
Atlanta, Ga.

W. C. TROUT, president, Lufkin, Tex.; GEO. B. COCKER, vice president, Gastonia, N. C.; W. E. DUNN JR., secretary-treasurer, Healey building, Atlanta, Ga. The 1926 convention to be held at Macon, Ga., the date to be announced later.

Ohio State Foundrymen's Association

WALTER L. SEELBACH, president, Walworth Run Foundry Co., 2488 West Twenty-seventh street, Cleveland; C. C. SMITH, vice president, Toledo Steel Casting Co., Toledo, O.; E. SANDS, treasurer, Superior Gas Engine Co., Springfield, O.; ARTHUR J. TUSCANY, secretary-manager, 5713 Euclid avenue, Cleveland.

Chicago Foundrymen's Club
Chicago

CHARLES L. LARSEN, president, Armour Institute of Technology, 3300 Federal street, Chicago; GEORGE H. ROLINSON, vice president, American Brakeshoe & Foundry Co.; E. C. BARRINGER, secretary-treasurer, THE FOUNDRY, 1147 Peoples Gas building, Chicago. Meetings second Saturday in each month at the City club, 315 Plymouth court.

Pittsburgh Foundrymen's Association
Pittsburgh

WILLIAM K. FRANK, president, Damascus Bronze Co., South avenue, N. S. Pittsburgh; L. V. STEVENS, vice president, Locomotive Stoker Co., Pittsburgh; WM. J. BRANT, secretary-treasurer, Wm. J. Brant, Bessemer building Pittsburgh. Meetings on the third Monday of the month, except in July and August, at the Fort Pitt hotel.

Quad-City Foundrymen's Association
East Moline, Ill.

P. T. BANCROFT, president, John Deere Harvester Works, East Moline, Ill.; J. H. DIEDRICH, vice president, Black Hawk Foundry Co., Davenport, Ia.; D. H. WARD, secretary-treasurer, Union Malleable Iron Co., East Moline. Meetings the third Monday evening of each month, the meeting place being rotated between Moline, Rock Island, and Davenport.

Detroit Foundrymen's Association
Detroit

ROBERT CRAWFORD, president, Atlas Foundry Co., 131 South Artillery street, Detroit; J. J. BOLAND, vice president, Griffin Car Wheel Co., Detroit; RUSSELL M. SCOTT, secretary, Packard Motor Car Co., 1580 East Grand boulevard, Detroit; FRED COWAN, treasurer, W. R. Thompson Co., Detroit. Meetings third Thursday in each month at the Union League club, 35 Grand River avenue, Detroit.

Philadelphia Foundrymen's Association
Philadelphia

CHARLES R. SPARE, president, American Manganese Bronze Co., Holmesburg, Philadelphia; C. F. HOPKINS, vice president, Ajax Metal Co., 46 Richmond street, Philadelphia; W. G. SUMMERS, treasurer, Phoenix Iron Co., Philadelphia; HOWARD EVANS, secretary, J. W. Paxson Co., Nicetown Lane and D street, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Metropolitan Brass Foundry Association
New York

THOMAS HARPER, president, Thomas Harper, 204 Lafayette street, New York; W. D. GOLDSMITH, vice president, C. A. Goldsmith Co., Newark, N. J.; F. H. LANDOLT, treasurer, 111 Dobbins street, Brooklyn, N. Y.; WM. E. PAULSON, secretary, Thomas Paulson & Son, Inc., 97 Second avenue, Brooklyn, N. Y. Meetings second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Equipment Inquiries Heavy

Many Plants Seeking Information on Machines for Expansion and Replacement Purposes—December Exports Show Decided Gain

FOUNDRY equipment business continues to show signs of improvement in practically all distributing centers, the one exception being in the New York territory where the market is spotty. The greatest betterment is noted in the western section, where manufacturers report sales in January, 20 per cent above the business for the corresponding month a year ago, and that returns thus far in February indicate another satisfactory month.

Inquiries are being brought out in a heavy volume, and are of such a nature that men of the trade look for an early closing on many items. One feature of the market is the diversity of the demand, practically all lines of equipment securing a share of the business.

Exports of foundry and molding equipment in December showed a substantial gain over the value in November, the value of exports being $72,053 as compared with $34,011 in November and $38,845 in December, 1924, according to a recent report of the department of commerce. The exports for the 12 months ended Dec. 31 were valued at $688,956 as compared with $517,410 in the corresponding period the previous year. This is a gain of 33 per cent over the previous year.

Sales Volume Gains in Several Centers

FOUNDRY equipment buying in the New York district continues spotty. With construction at a low ebb, virtually all buying is for replacements and is comprised chiefly of orders for single items. Sellers look for no material increase in business before the first of March, which usually is an active month. A discouraging feature of the market so far this year has been a lack of car business in the volume anticipated a few weeks ago. However, the situation is not without promise that some substantial buying by railroads will develop over the next two to three months which should be reflected in equipment orders. The A. P. Grimm Foundry Co., Inc., Raritan, N. J., is expanding and recently has purchased two cupolas from the J. W. Paxson Co., Philadelphia, five molding machines from the Herman Pneumatic Machine Co., Zelienople, Pa., a 2 and a 10 ton electric crane, the latter with 47 foot span, from the Northern Engineering Works, Detroit. Two molding machines each have been sold to the Florence Pipe Foundry & Machine Co., Burlington, N. J. and A. Weiskittle & Son Co., Baltimore, and one to the Burham Boiler Corp., Elizabeth, N. J., by the Herman Pneumatic Machine Co. The Lennox Furnace Co., Syracuse, N. Y. has taken dust-arrester equipment from the Pangborn Corp., Hagerstown, Md. The Louis Sacks Foundry Co., Newark, N. J., has purchased two tumbling mills and dust-arrester equipment from the W. W. Sly Mfg. Co., Cleveland, while the Baldwin Locomotive Works, Philadelphia, has ordered sand mixing machinery from the National Engineering Co., Chicago. The Williamstown Foundry Co., Williamstown, N. J., the Newport News Shipbuilding Co., Newport News, Va., and the Caroline Foundry Co., Baltimore, each have ordered a cupola from the J. W. Paxson Co., Philadelphia. The Beardsley & Piper Co., Chicago, has sold a tractor type sand throwing machine to D. Drury & Co., Johannesburg, South Africa, and has shipped two machines to Metters, Ltd., Sidney, Australia. The Annville Foundry Co., Annville, Pa., has purchased a 20-ton used locomotive crane, equipped with 2-cubic yard bucket and a 50-foot boom, from Philip T. King, 50 Church street, New York.

Requests Catalogs

COMPANIA ARGENTINA DE HIERROSY ACEROS, (Pedro Vasena E. Hijos) Lda, Buenos Aires, Argentina, wishes to obtain catalogs of American made foundry equipment and supplies.

Chicago Sales Increase

SEVERAL of the larger manufacturers in the Chicago district found sales in January running 20 per cent ahead of January, 1925. Inquiry thus far in February indicates that the gain is being held. Four additional sand throwing machines of the stationary type have been sold to the Standard Sanitary Mfg. Co., Louisville, Ky., by the Beardsley & Piper Co., Chicago. That company also has sold sand throwing machines of the tractor type to the American Seating Co., Grand Rapids, Mich., the Wolff Mfg. Co., Chicago, and the Rundle Mfg. Co., Milwaukee. The Holmes Foundry Co., Port Huron, Mich., has purchased a tractor type machine and a sand cutter, the Kedzie Foundry Co., Chicago, has acquired a locomotive type, and the Nash Motors Co., Kenosha, Wis., has secured a stationary type from the same manufacturer. Sand mixing machinery has been sold by the National Engineering Co., Chicago, to the Elkhart Iron Works, Elkhart, Ind., the Wagner Malleable Iron Co., Decatur, Ill., and Fairbanks, Morse & Co., Beloit, Wis. The Standard Foundries Co., Oakland, Calif., has purchased a sandblast machine with complete equipment, the Pacific Malleable Castings Co., Oakland, has taken two complete sandblast installations, and the Market Street Railways, San Francisco, has ordered sandblast equipment from the Pacific Graphite Works, Oakland, Calif., representatives for the J. W. Paxson Co., Philadelphia. Sandblast equipment has been ordered by the General Electric Co., Ft. Wayne, Ind., and the Key System Transit Co., Oakland, Calif., from the Pangborn Corp., Hagerstown, Md. The Stoney Foundry Engineering & Equipment Co., Cleveland, has sold shakeout bails to the Romeo Foundry Co., Romeo, Mich., and the Lakey Foundry & Machine Co., Muskegon, Mich., and vibrator and shakeout equipment to the Standard Foundry Co., Racine, Wis., the Griffin Wheel Co., Kansas

City, Kans., the Waterloo Gas Engine Co., Waterloo, Ia., and the Holmes Foundry Co., Port Huron, Mich. The Covel Mfg. Co., Benton Harbor, Mich., has purchased two tumbling mills from the W. W. Sly Mfg. Co., Cleveland, while the Sibley Machine Co., South Bend, Ind., has taken tumbling mill equipment and the Union Steam Pump Co., Battle Creek, Mich., has secured a tilted type sandblast mill from the same manufacturer. Molding machines have been sold to the Illinois Malleable Iron Co., Chicago, and the Oklahoma Iron Works, Tulsa, Okla., by the Herman Pneumatic Machine Co., Zelienople, Pa. The American Radiator Co., Kansas City, Mo., has taken three molding machines from the same manufacturer.

Pittsburgh Buyers Encouraged

SELLERS of equipment and supplies in the Pittsburgh area are greatly encouraged over the way business has developed in February, and inquiries are numerous for diversified lines of equipment. In many directions foundry operation is not improving to any great extent, but a number of foundries are lining up their equipment needs and the outlook for spring buying is good. In the molding machine line, expansion programs have advanced further than in connection with other equipment, and manufacturers like the Herman Pneumatic Machine Co., Zelienople, Pa., report not only the largest number of inquiries ever encountered, but that orders are developing at a fast rate. Orders for molding machines received by the Herman company include two for the Pressed Steel Car Co., McKees Rocks, Pa., and one for the Pittsburgh Plate Glass Co., Creighton, Pa., the Continental Gin Co., Birmingham, Ala., and the Locomotive Stoker Co., Pittsburgh. Dust-arrester equipment has been ordered by the National Radiator Co., Johnstown, Pa., from the W. W. Sly Mfg. Co., Cleveland, while the Richmond Radiator Co., Uniontown, Pa., has ordered shakeout bails from the Stoney Foundry Engineering & Equipment Co., Cleveland. The Egan Johnson Steel & Iron Co., Crum Lynn, Pa., has taken sandblast equipment from the Pangborn Corp., Hagerstown, Md. The Sharon Foundry Co., Wheatland, Pa., has purchased one core oven furnace from the Mayor Fuel Saving Furnace Co., Cleveland. The Bessemer Gas Engine Co., Grove City, Pa., is arranging for the early installation of additional equipment in its new extensions. One or two cupola inquiries are pending and several core oven propositions are up for attention. The General Electric Co., Schenectady, N. Y., bought a 3-ton crane for Fort Wayne, Ind., from the Whiting Corp., and is in the market for a 3-ton crane for Schenectady. The Union Switch & Signal Co., Swissvale, Pa., closed on a 5-ton crane with 33-foot span with the Shaw Electric Crane Works, Muskegon, Mich.

Cleveland Market Steady

LITTLE change is noted in the market for foundry equipment in the Cleveland territory, although prospects for a greater volume of sales in the near future appear bright. A fairly satisfactory volume is being secured by manufacturers, although the increase in business predicted for shortly after the first of the year is not materializing rapidly. However, inquiries are exceptionally heavy, and this coupled with the satisfactory condition found in many foundries, leads to the belief that foundries are going to be in the market strong in the near future. Two tumbling mills have been purchased by the Hardwick Stove Co., Cleveland, Tenn., and one by the Fanner Mfg. Co., Cleveland, from the W. W. Sly Mfg. Co., Cleveland, while the Ross-Meehan Foundries, Chattanooga, Tenn., has secured a tilted type, sand-blast mill from the same manufacturer. The Packard Motor Car Co., Detroit, has purchased sand-blast and dust-arrester equipment and the Erie Forge Co., Erie, Pa., has taken dust-arrester equipment from the Pangborn Corp., Hagerstown, Md. Shakeout bails have been taken by the Gurney Foundry Co., West Toronto, Canada, and the Ferro Machine & Foundry Co., Cleveland, and vibrator and shakeout equipment by the Columbia Sanitary Mfg. Co., Louisville, Ky., and the American Radiator Co., Buffalo, from the Stoney Foundry Engineering & Equipment Co., Cleveland. Two molding machines have been ordered by the American Radiator Co., Buffalo, from the Herman Pneumatic Machine Co., Zelienople, Pa., while the Barnes Mfg. Co., Mansfield, O., has ordered a tractor type sand throwing machine from the Beardsley & Piper Co., Chicago. The Erie Forge Co., Erie, Pa., has secured a furnace for a pit mold dryer from the Mayor Fuel Saving Furnace Co., Cleveland. Dodge Bros., Detroit, have closed on sandblast equipment from the J. W. Paxson Co., Philadelphia. Repair business has slackened recently.

New England Inquiry Improves

EQUIPMENT inquiry in the New England territory is much improved and sales continue to hold approximately the same level as noted several weeks ago. Included in recent sales is sandblast equipment ordered by the Brown & Sharpe Mfg. Co., Providence, R. I., from the Pangborn Corp., Hagerstown, Md. The Artistic Bronze Co., Bridgeport, Conn., has closed on a water polishing mill from the W. W. Sly Mfg. Co., Cleveland, while the Draper Corp., Hopedale, Mass., has taken sand mixing machinery from the National Engineering Corp., Chicago, as has the General Alloys Co., Boston. The Herman Pneumatic Machine Co., Zelienople, Pa., has placed a molding machine with the Washburn Shops of the Worcester Polytechnic institute, Worcester, Mass.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Ellison Brass Mfg. Co., Jamestown, N. Y., has been changed to the Ellison Bronze Co.

Fawver Foundry Co., Los Angeles, has reopened its plant at 2418 East Fifty-third street.

The Allied Steel Castings Co. operating an open-hearth steel foundry at Harvey, Ill., is enlarging its cleaning room. Practically all of the equipment required has been placed. The 100 tons of structural steel required for the addition has been placed with the Gage

Bert Curry, Ponca City, Okla., has started rebuilding his foundry, recently burned, the chamber of commerce assisting.

Service Foundry Co., Wichita, Kans., has been incorporated with $50,000 capital to operate a gray iron foundry.

Fedders Mfg. Co., Buffalo, has leased the plant built by the Buffalo Smelting Co., and will make aluminum castings and radiator shells. Mr. Giessen is in charge of the plant.

J. Roy Tracy, Box 791, Route 1, Buena Vista station, Miami, Fla., proprietor of the Miami boatyard is contemplating the construction of a small brass foundry to make castings up to 300 pounds weight.

Portsmouth Stove & Range Co., Portsmouth,

O., is having plans made to double its present enamel plant. F. V. Knauss is manager.

Rickersberg Brass Co., East Thirty-seventh street and Perkins avenue, Cleveland, will build a 1-story addition to its plant.

Detroit & Michigan Stove Co., 6900 East Jefferson street, Detroit, is having plans made for a 5-story factory building 82 x 174 feet.

Worthington Pump & Machinery Corp., Buffalo, J. A. Leepfer works manager, Clinton street and Roberts avenue, is having plans made for an addition to its plant here.

Ben Sibbitt Iron & Foundry Co., Wichita, Kans., will establish a branch plant and warehouse at Lubbock, Tex., in charge of George Draut as state manager.

Acme Foundry & Machine Co., Blackwell, Okla., E. L. Graham general manager, has leased building and will build three others to house new foundry and machine shops.

John Tarleton Agricultural college, Stephenville, Tex., is planning a foundry designed for 15 students. Prof. A. A. McSweeney is in charge of this work.

Atlas Stove & Casting Co., Newark, N. J., has been incorporated with $50,000 capital by Max Danzig, Israel Danzig and others. Scher & Albert, Newark, are attorneys.

Franklin Brass Foundry, New York, has been incorporated with $10,000 capital by B. Groberg, and R. M. Bernheim. D. Groberg, 861 Manhattan street, Brooklyn, is attorney.

General Electric Co., Fort Wayne, Ind., C. H. Matson construction superintendent, 1635 Broadway, will build a 1-story sawtooth foundry 81 x 121 feet. General contract to Buesching-Hagerman & Co., 4012 Superior street.

American Radiator Co. has plans under consideration for materially enlarging its plant at Buffalo by additions to its core room, annealing and shipping departments and installation of a system of continuous molding.

Vernon Foundry Co., Los Angeles, William A. De Santis, manager and owner, plans the enlargement of its plant. High pressure domestic gas is being considered for melting purposes.

Progressive Foundry Co., Rochester, N. Y., has been formed by the consolidation of the Rochester Castings Corp., and the Progressive Co.

Wisconsin Cylinder Foundry Co., Racine Junction, Wis., has completed an extension of its foundry which will be devoted to the production of motorcycle cylinder castings for several manufacturers of these vehicles.

Smoot-Holman Co., Inglewood, Los Angeles, has started operation of its gray iron foundry, Norman P. Earle superintendent. Casting plant covers 13,500 feet and addition will be built soon.

Armor Plate Engineering Co., Detroit, has been incorporated with 1000 shares no par value to manufacture tools and operate a foundry by John E. Martz, 919 Bank building, Mildred P. Herman and Manfred H. Herman.

Progressive Brass Foundry, Brooklyn, N. Y., has been organized to operate a foundry at 3 Ainslie street by Vincent Consoli, 85 Montrose street; Joseph Ingegnere, 171 Rutledge street; Anthony Sangiorgio, 85 Montrose avenue. Structural Steel Co., Chicago.

A foundry addition, 90 x 120 feet, 24 feet high, will be built by the Walker Mfg. Co., at Hamilton and Michigan streets, Racine, Wis. The company manufactures a line of cast and stamped automobile accessories, principally jacks.

Wymarsh Foundry Inc., Hornell, N. Y., idle for the past three years, has resumed operations and will employ about 200 men. George Martin, president, announces sufficient orders to keep the plant running for at least seven months without booking additional business.

Superior Foundry Co., Cleveland, has sold its piano plate department, one of the smaller portions of the business, and will use the space and facilities to further develop and increase its jobbing business in gray iron and semisteel. The piano plate business has been taken over by the Wickham Piano Plate Co., Springfield, O., and the Paragon Foundries Co., Oregon, Ill.

Flint Malleable Castings Co., Flint, Mich., which recently was organized with a capitalization of $50,000, now is in production. The foundry is housed in a new building with equipment of the latest design installed. The plant has a capacity of 60 tons per day, the production now being near full capacity, specializing in automotive parts. The officers are as follows: President, J. M. Baringer, secretary, C. W. Bonbright, treasurer, E. W. Atwood, all of Flint.

The Saginaw Products Co., Saginaw, Mich., a division of General Motors Corp., will spend $260,000 for the completion of improvements now being made at its malleable iron foundry, bringing the total appropriation for the improvements in the past six months to $830,000. These improvements will increase the production of the foundry from 2000 to 3000 tons of castings monthly. The company is pioneering in a new method of melting for malleable iron foundries. The improvements include the installation of electric furnaces and cupola buildings. Employment of 850 is expected to be boosted to 2500 immediately.

Marshall Foundry Co., Marshall, Mich., has been incorporated with $125,000 capital to operate the foundry formerly conducted by the Flint Foundry Co., with capacity of 60 tons per day. It is producing 30 tons per day at present, in manifolds and other gray iron automotive parts. The foundry is equipped to handle core work on a production basis. Harry A. McDonnough, Detroit, is president and chairman of the board; C. H. Billings, cashier First National bank, Marshall, vice president; C. J. McNamara, Milwaukee, secretary, treasurer and general manager. Sales will be managed by the W. R. McDonough Co., General Motors building, Detroit, and 620 National building, Cleveland.

Chattanooga Implement & Mfg. Co., Chattanooga, Tenn., is to erect another unit to its plant in 1926. It will be of the same size and character as the addition made last year. E. H. Sholar, president of the company, states that the business of the concern will be greatly expanded during the coming year and the duplication of last year's addition is being considered. The addition will call for an expenditure of more than $100,000. The company manufactures agricultural implements and fire place fittings. A new model plow to be attached to the side of a tractor manufactured by the Ford Motor Co., has just been developed by the company.

New Trade Publications

HAND LAMPS—Trouble lamps designed for the severe service of industrial plants are shown and described in a bulletin issued by Crouse-Hinds Co., Syracuse, N. Y.

SCALES—Toledo Scale Co., Toledo, O., has issued a booklet on automatic scales. The weight of the material is read directly from a large dial on the scale.

FURNACES—Crucible furnaces using both preheated air and fuel are described in a folder issued by the U. S. Industrial Engineering Co., Cleveland. The preheating unit is self contained.

MELTING POTS—Electric melting pots for babbitt? lead, solder, etc., are shown in a pamphlet just issued by the General Electric Co., Schenectady, N. Y. The pots may be supplied with automatic control for temperature.

AIR COMPRESSORS—Centrifugal air compressors for cupola blowing and other purposes are shown with their ratings, operating characters and construction details in a folder published by the General Electric Co., Schenectady, N. Y.

SWITCHES—Automatic switching equipment for power and industrial service is depicted in a catalog distributed by the General Electric Co., Schenectady, N. Y. The advantages and protective features of this type of equipment are enumerated.

SAFETY SWITCHES—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued a catalog of its industrial, motor starting and meter service switches. A number of new types have been added to the Westinghouse line since the preceding catalog.

SAWS—A catalog issued by Huther Bros. Saw Mfg. Co., Rochester, N. Y., presents its line of circular saws, various circular cutting tools for wood and metal working, and accessories for keeping saws in condition. Complete description and data are given.

ORANGE PEEL BUCKETS—Three-sided orange peel buckets are described and illustrated in a bulletin published by the Hayward Co., New York. This type of bucket is designed to handle boulders and other odd shaped material. They are made with the rope reeved or the power wheeled mechanisms for opening and closing.

STACKING AND LIFTING—Various types of elevating and handling devices made by the Lewis-Shepard Co., Boston, are described in a catalog recently issued. The types run from a lift truck, operated by hand to portable elevators operated either by hand or motor.

FUEL—A folder giving the various factors that confront, and must be considered by a manufacturer concerned with the installation of industrial heating equipment, is being issued by the W. S. Rockwell Co., New York. Comparative costs per million British thermal units at unit prices of various fuels are given.

CLAM SHELL BUCKETS—The Hayward Co., New York, has issued a catalog describing two types of clam shell buckets. One bucket is of the rope reeved or block and fall type and the other has the power wheel type of closing mechanism. These buckets are made in different sizes for various kinds of digging.

CRANES—Link-Belt Co., Chicago, has issued a catalog of 48 pages showing the use of the drag-line, dipper and trench shovel, skimmer scoop, hook blocks and pile drivers in connection with a portable crane designed by the company. Data on lifting capacities, operating speeds, line pull, tractive effort, etc., are given.